2

HOLYOKE WATER POWER COMPANY

MOUNT TOM GENERATING STATION

PERMIT NO. MA0005339

DRAFT

40 CFR 122.21(r) REPORTS

SOURCE WATER BODY DESCRIPTION
COOLING WATER INTAKE STRUCTURE DATA
COOLING WATER SYSTEM DATA REPORT

September 2005

COPY entire Report

Prepared by:

Kleinschmidt

Energy & Water Resource Consultants

HOLYOKE WATER POWER COMPANY

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HOLYOKE WATER POWER COMPANY

MT. TOM STATION
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SOURCE WATER BODY DESCRIPTION

EXECUTIVE SUMMARY

The following Source Water Body Description Report is being submitted to the Massachusetts Department of Environmental Protection (MA DEP) and EPA Region 1 by Holyoke Water Power Company (HWP) on behalf of the Mt. Tom Station (Mt. Tom). The report complies with the U.S. Environmental Protection Agency (EPA) Clean Water Act 316(b) Phase II rule for required data to be submitted when Phase II facilities apply for a reissued NPDES permit. The following physical data of the source water body is being provided to help characterize the facility and evaluate the type of waterbody and species potentially affected by the cooling water intake structure, as required under 40 CFR 122.21(r)(2).

1. A narrative description and scaled drawings showing the physical configuration of all source waterbodies used by the facility, including areal dimensions, depths, salinity and temperature regimes;
2. an identification and characterization of the source waterbody's hydrological and geomorpological feature;
3. Locational maps;

The description contained within this document, accompanied by the drawings of the intake structure, address the three criteria required.

A review of the 316(b) rule applicability criteria indicates that Mt. Tom qualifies as a Phase II facility: its cooling water intake design flow exceeds 50 MGD; its primary activity is to generate electricity; at least 25% of the water withdrawn is used exclusively for cooling water purposes; and the station was constructed prior to January 17, 2002.

While the Station qualifies as a Phase II facility, applicability of the impingement mortality and entrainment reduction standards varies by source water body classification and intake design. Cooling water is withdrawn from the Connecticut River, which is classified as a freshwater river at Mt. Tom.

1.0 RULE APPLICABILITY

1.1 Definition of a Phase II Existing Facility

The U.S. EPA has published final regulations under Clean Water Act (CWA) §316(b) establishing requirements for cooling water intake structures at Phase II Existing Facilities (See 69 Fed. Reg. 41576, July 9, 2004). The regulations apply to power generation stations that qualify as Phase II Existing Facilities based on the following criteria as described in Sections §125.91 and §125.93 of the 316(b) Rule (USEPA 2004, 41,683-41,684):

- The facility is a point source that uses or proposes to use one or more CWIS(s) that withdraw(s) cooling water from waters of the United States,
- The CWIS has a total design intake flow greater than or equal to 50 million gallons per day (MGD),
- The facility's primary activity is to generate electric power,
- The facility uses at least 25 percent of the withdrawn water exclusively for cooling purposes, and
- The facility's construction started on or before January 17, 2002.

A facility must comply with the 316(b) regulations in order to renew its National Pollutant Discharge Elimination System (NPDES) permit. Under 316(b) regulations, compliance generally requires a facility to reduce its impingement mortality by 80 to 95 percent and, if applicable, its entrainment by 60 to 90 percent from calculation baseline.

1.2 Mt. Tom Applicability Assessment

Mt. Tom qualifies as a Phase II facility for the following reasons:

- Mt. Tom's primary activity is to generate electric power.
- Mt. Tom is a point source that uses one CWIS to withdraw cooling water from the Connecticut River, a water of the United States.

- Mt. Tom uses more than 25 percent of the withdrawn water for cooling purposes.
- Mt. Tom's total design intake flow is greater than 50 MGD.
- Mount Tom started commercial operation in 1960.

Determining appropriate impingement mortality and entrainment performance standards requires further evaluation that considers existing fish protection technologies and other measures such as capacity factor, intake velocity, and flow reduction. This assessment is performed under separate cover in the Proposal for Information Collection.

2.0 SOURCE WATER BODY DESCRIPTION

Mt. Tom Station is located at approximately river km 148 on the Connecticut River in the City of Holyoke, MA. The Connecticut River is the largest river in New England, flowing south through Vermont, New Hampshire, Massachusetts, and Connecticut before discharging into Long Island Sound. Numerous tributaries enter the river throughout its course, including the Millers and Deerfield Rivers upstream of the Holyoke Project reach. As the Connecticut River flows through Massachusetts, it can be characterized as wide, slow, and meandering. Flows in the river are monitored by U.S. Geological Service gauges in Montague, MA and near the dam in Holyoke, MA, which is located approximately 5 miles downstream of Mt. Tom. The USGS website for gauge number 01170500 shows the annual mean river flow (1905-2003) to be 13,982 $ft^3 \cdot sec^{-1}$). However, seasonal extremes can range from more than 60,000 $ft^3 \cdot sec^{-1}$ in spring, when the wide, shallow floodplain in the river valley is frequently inundated with high runoff, to less than 5,000 $ft^3 \cdot sec^{-1}$ in summer. The Connecticut River is classified as freshwater in this region.

As can be seen in Figure 1, the Mt. Tom cooling water intake structure (CWIS) is located on the western shore of the Connecticut River on an S-curve, and is oriented parallel to flow. River water enters the submerged CWIS (screenwell structure) through an 8-foot (inside) diameter concrete intake pipe approximately 30 feet from the riverbank. The screenwell structure floor elevation is 85'-0" at the location of the traveling screens. The CWIS inlet pipe invert elevation is 87'-0" in the river. Figures 2, 3 and 4 show the relationship of the intake pipe and CWIS to their location in the Connecticut River water column. Other water level elevations are noted below (Chain Belt Co., 1958).

- Minimum Low Water 98'-0" feet
- Average Water 102'-6" feet
- Normal Annual High Water 112'-0" feet
- Extreme High Water 128'-0" feet

Since no hydrological studies or reports were readily available for Mt. Tom, information gathered for the Holyoke Hydroelectric Project (which is located approximately 5 river miles downstream of Mt. Tom) has been used to describe the source water body. In general, water quality in the Connecticut River near Mt. Tom is good at the present time, meeting Commonwealth of Massachusetts Class B standards. Class B waters should have consistently good aesthetic criteria and are designated as habitat for fish, other aquatic life, and wildlife and are for primary and secondary contact recreation, such as swimming and boating. Other existing uses include agricultural irrigation and water for compatible industrial cooling and manufacturing processes. Although Class B waters can be suitable for public water supply with appropriate treatment, the Connecticut River is not used for drinking water in Massachusetts or Connecticut (NUSCO, 11/96).

A water quality survey was completed for the Holyoke Project during 1995-96, and had objectives that included gathering basic information on parameters such as dissolved oxygen (DO) and pH and chemical constituents (e.g., dissolved nutrients) in water and sediment samples. Measurements of PCBs in sediments and heavy metals in both water and sediment also provided evidence on contaminants of concern in the Connecticut River. Most water quality sampling took place during a period of extremely low flow and precipitation period in late summer of 1995. Additional collections were made during December (limited by ice cover) and following the spring 1996 freshet, which was lengthy because of heavy winter precipitation. A summary of the findings of the water quality survey performed by Northeast Utilities is presented below. Please reference Figure 5 to help locate the sampling areas mentioned in the text below.

2.1 Water Temperature

Maximum surface water temperature was recorded on August 16 and varied from 25.9°C at Sunderland to 29.1°C at the Route 202 Bridge in Holyoke. Some of the generally increasing trend in temperature found from north to south during the August sampling may have been due to daily temporal variations, as the Impoundment, Second Level Canal, and Route 202 Bridge stations were usually sampled during late afternoon, when daily temperatures would have been highest. However, it is likely that these three southerly stations were slightly warmer than upriver areas during summer. Water temperatures of 28.7-29.1°C recorded at the Route 202 Bridge on August 16 were somewhat above the Massachusetts Class B water standard of 28.3°C for warmwater fisheries, but based on results of the resident fish survey and benthic invertebrate sampling, these temperatures were not detrimental to aquatic life in this section of the river. During the late summer sampling, mean daily river flow below Holyoke Dam on August 16 was 6,130 $ft \cdot sec^{-1}$ and on August 30 was 1,280 $ft \cdot sec^{-1}$ (Davies et al. 1996). During September 11-12, river flows were at a water-year minimum of 911-925 $ft \cdot sec^{-1}$, but had increased to 2,020-2,490 $ft \cdot sec^{-1}$ on September 13-14. Also by mid-September, the range of surface water temperatures decreased to 19.8-21.8°C, with coolest water found at Sunderland and Hatfield. Because the September readings were taken over 4 days, some variation was likely due to temporal and weather effects. December temperatures were near annual lows, ranging from 0.1 to 0.3°C at the surface for stations above the Holyoke Dam, where the river was mostly ice-covered; water temperature was 0.9°C near the Route 202 Bridge, which was ice-free. In May, water temperatures appeared to be consistent (15.6-16.3°C) in all areas except the Oxbow, which had warmed more quickly to 17.7°C.

Little vertical thermal stratification was found in the waters of the project reach. With few exceptions, differences between surface and bottom temperatures were 0.8°C or less. Near Mt. Tom on September 12, a 1.7°C gradient existed between the surface and bottom (6 m). Some of the largest (1.4 to 2.3°C) temperature differences were found in the relatively shallow (2-3 m) Oxbow during August and September. Even larger variations between surface and bottom were found in the Oxbow for DO and pH, both of which will be discussed below. The Oxbow likely has greater water column stability than the river proper due to lack of strong water currents (particularly during the low flows in summer 1995) and somewhat greater protection from winds, both of which can reduce or eliminate stratification by mixing, particularly when thermal gradients are slight.

2.2 Dissolved Oxygen (DO)

DO concentrations at the surface were lowest on August 16 (7.5-8.6 $mg \cdot L^{-1}$) and highest (10.8-12.1) on December 18. Variation in DO concentration occurred among the stations for any particular sampling date, but no consistent trends were apparent. In nearly all instances, DO concentrations and percent saturation exceeded Massachusetts Class B water quality standards of 5 $mg \cdot L^{-1}$ and 60% saturation for warmwater fisheries. The only exception was a DO concentration of 3.8 $mg \cdot L^{-1}$ (43% of saturation) found near the bottom (3 m) in the Oxbow on August 30. The DO concentrations in the Oxbow on May 23 were from 0.9 to 1.4 $mg \cdot L^{-1}$ lower than at any of the other river stations. This was possibly due to decreased solubility related to accelerated spring warming in the shallow, protected Oxbow section of the river.

2.3 pH

At nearly all stations, values of pH decreased from the start of the water quality sampling on August 16 through May 23. Overall, pH was highest in the Oxbow and at the Route 202 Bridge. In general, pH values did not show consistent patterns from station to station, except for elevated levels found during summer in the Oxbow. The relatively alkaline pH readings (≥7.2 standard units) in nearly all instances during August likely reflected photosynthesis from algal blooms and aquatic plants, which acted on the bicarbonate buffering system by removing CO_2. Except at Sunderland, where there was little change, pH decreased 0.4-0.8 units between August 16 and 30. In September, pH decreased in upriver areas, but remained elevated in the Oxbow, the Impoundment, and at the Route 202 Bridge. By December, pH readings were circumneutral, except at Mt. Tom, which had somewhat acidic values (6.6-6.8 units). Nearly all pH values were lowest on May 23, ranging from 6.5 at the surface at Mt. Tom to 7.1 at the bottom in the Impoundment. The lower pH found in spring may have been the result of acid precipitation, which entered the river through snowmelt and the heavy rainfall that occurred during the spring of 1996.

Little vertical stratification of pH was evident, with differences of only 0.1-0.3 units found at most stations. An exception was in the Oxbow, which had decreases of 0.8 to 1.5 units from surface to bottom in August and September. As mentioned previously, this was likely the result of algal bloom conditions, which drove the bicarbonate buffering system towards alkaline levels by removing CO_2. The pH of 8.8 (surface) and 8.4 (bottom) in the Oxbow on August 16 exceeded the Massachusetts Class

B water quality standard of 6.5-8.3 units, although this appears to have been the result of naturally occurring conditions. Similarly, the pH at the Route 202 Bridge was 8.3-8.5 on August 16, but subsequently decreased by 0.7 units during the following 2 weeks.

3.0 REFERENCES

Electric Fish Screen Co. Dwg. No. 59-100 Sheet 2 of 2, dated 2-10-59, "Electric Fish screen HWPC"

HWPC Dwg. No. 6058-M-84, Rev. 2, dated 2-10-59, "River Water Cooling Piping Sheet 1"

HWPC Dwg. No. 6058-M-135, Rev. 2, dated 10-3-59, "Screen Well House – General Arrangement".

HWPC Dwg. No. 6058-M-152, Rev. 4, dated 6-20-61, "Flow Diagram Cooling Water SH. No. 1"

HWPC Dwg. No. 6058-M-163, Rev. 7, dated 6-20-61, "Flow Diagram Circulating Water"

HWPC Dwg. No. 6058-M-185, dated 5-27-58, Mt. Tom Power Plant Unit #1 Station Heat Balance 148,480 KW"

HWPC Dwg. No. 6058-M-241, Rev. 3, dated 7-17-61, "Piping Screen Well House SH. 1".

HWPC Dwg. No. 6058-M-242, Rev. 3, dated 7-17-61, "Piping Screen Well House SH. 2".

HWPC Dwg. No. 6058-S-65, Rev. 3, dated 6-19-59, "Intake & Discharge in Yard".

HWPC Dwg. No. PMAC-37, "River Cross Sections at Intake".

Merchant, Capacity Utilization for Mount Tom Station Unit No. 1, 2000 through 2005

National Pollutant Discharge Elimination System (NPDES) permit, Permit #MA0005339 State Permit No. 278, receiving water Connecticut River.

National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Report (DMR), Once-Through Cooling Water Flows, Mt. Tom Station Permit No. MA0005339 from Jan-00 through Dec. 04.

National Pollutant Discharge Elimination System (NPDES) Permit Monitoring Record, HWPC Mt. Tom Station MA0005339 for Cooling Water Intake Flows from Jan-00 through Dec. 04.

National Pollutant Discharge Elimination System (NPDES) Permit Monitoring Record, HWPC Mt. Tom Station MA0005339 for Discharges No. 002, 005, 007, 008/009, 010/011 from Jan-00 through Dec. 04.

Northeast Utilities Service Company, Aquatic Services Branch, November 1996. Holyoke Project Water Quality Survey

Northeast Utilities System Dwg. No. 43719-96004, Rev. 2, dated 04/05, "Mt. Tom Station SPCC Plan".

U. S. Environmental Protection Agency. 2004a. Regional analysis document for the final Section 316(b) Phase II existing facilities rule.

U. S. Environmental Protection Agency. 2004b. Technical Development document for the final Section 316(b) Phase II existing facilities rule.

US Environmental Protection Agency. Region 1, Fact Sheet for HWPC Mt. Tom Station, Draft National Pollutant Discharge Elimination System (NPDES), Permit #MA0005339 State Permit No. 278, receiving water Connecticut River.

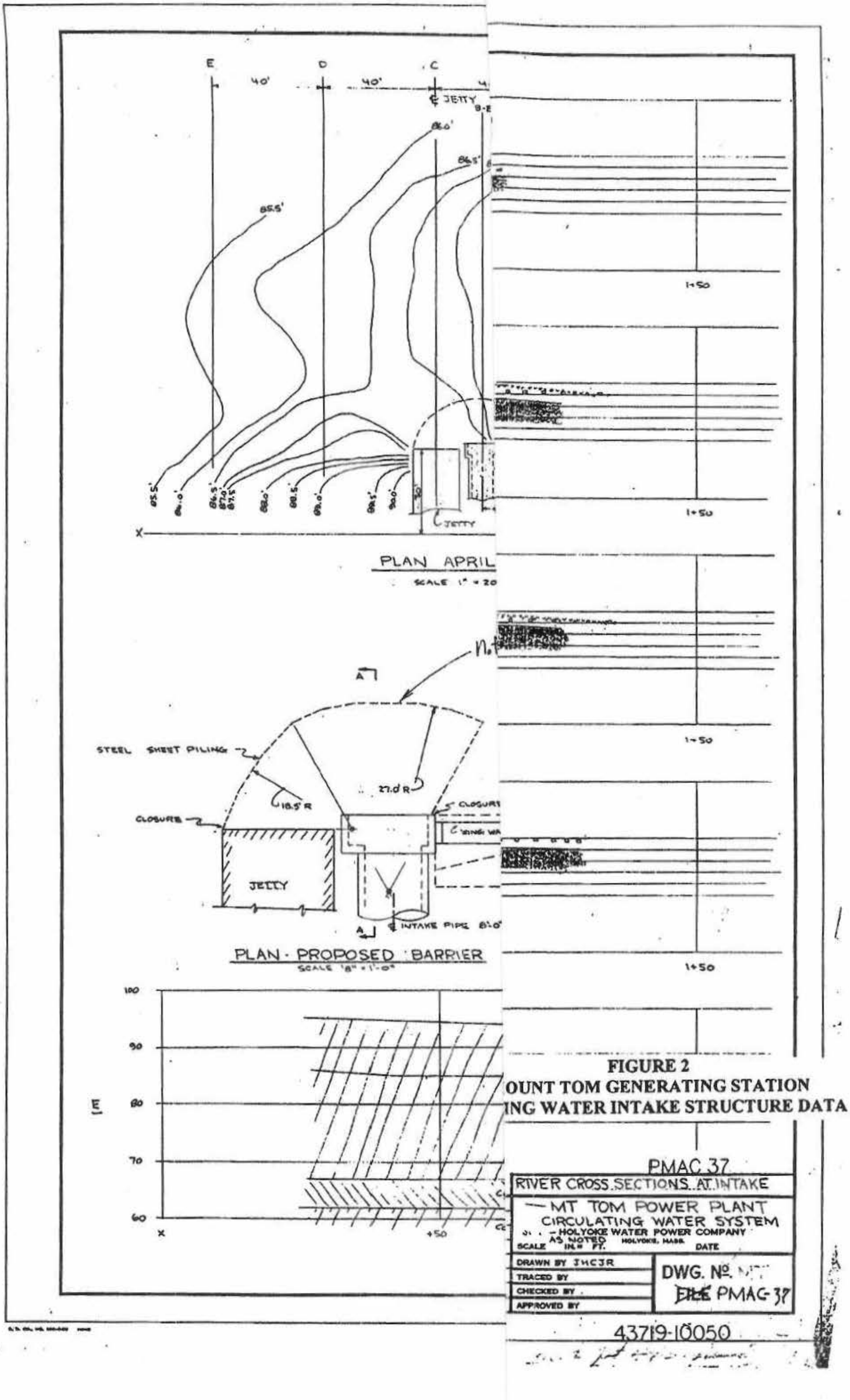


FIGURE 2
OUNT TOM GENERATING STATION
ING WATER INTAKE STRUCTURE DATA

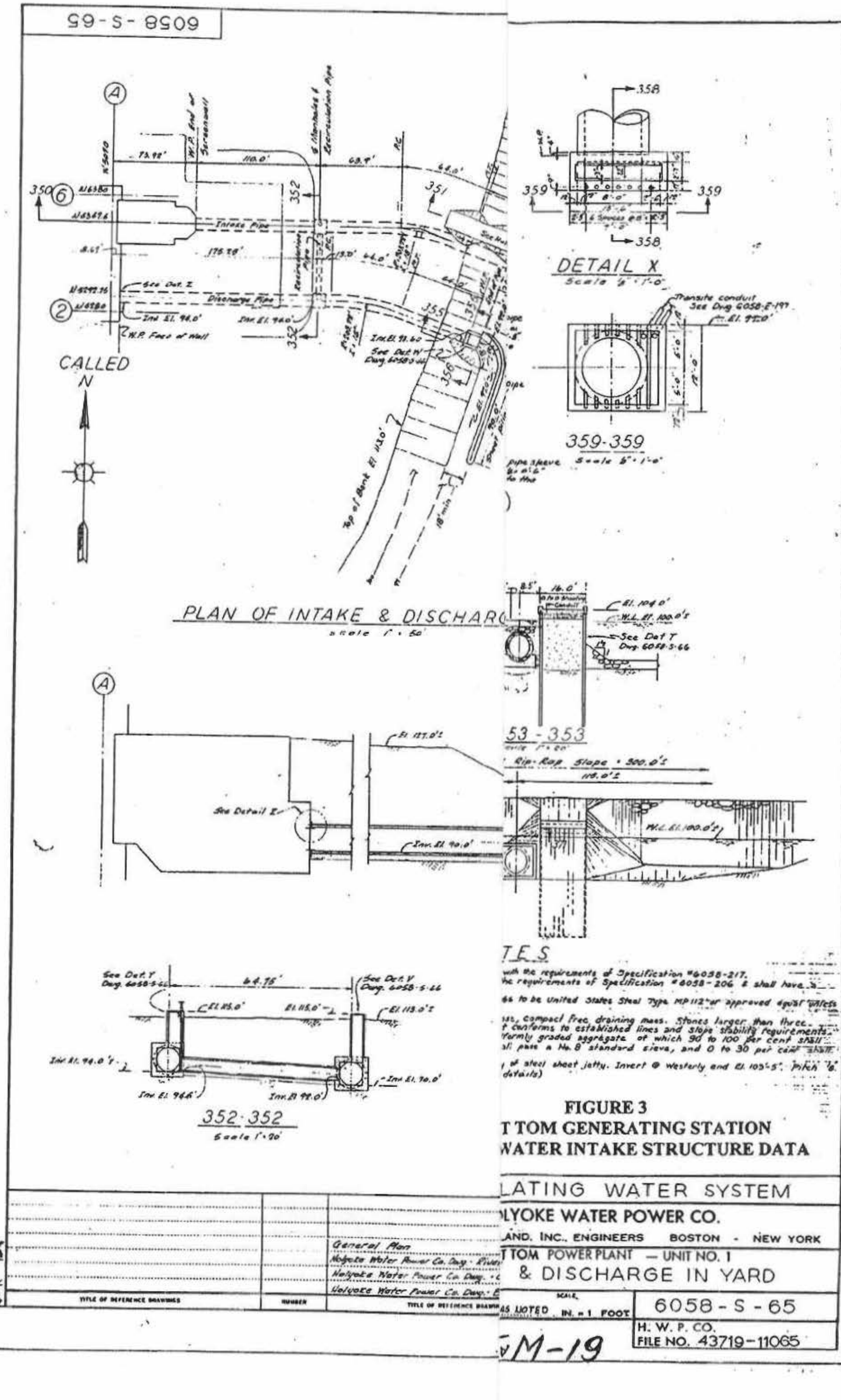


FIGURE 3
T TOM GENERATING STATION
WATER INTAKE STRUCTURE DATA

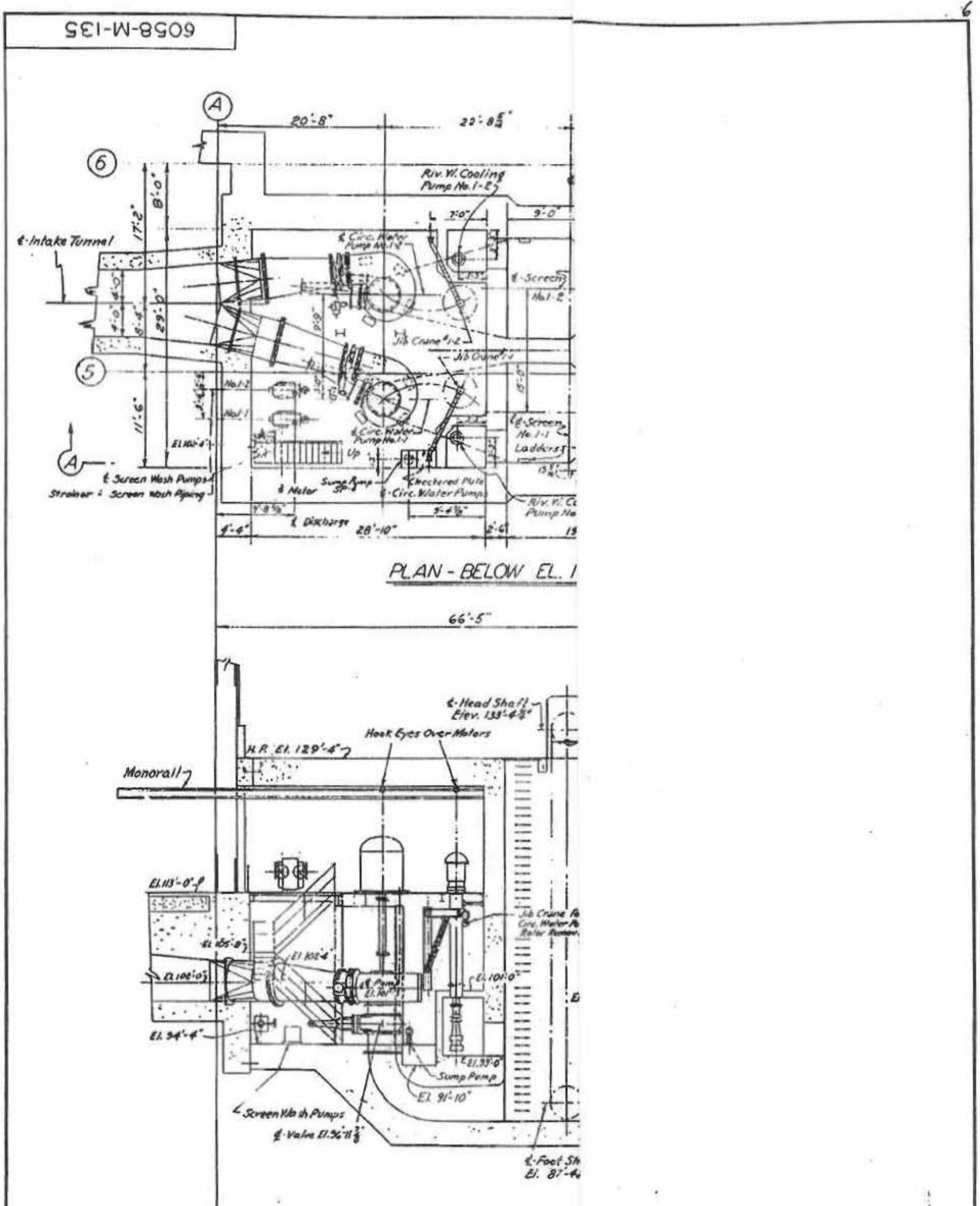
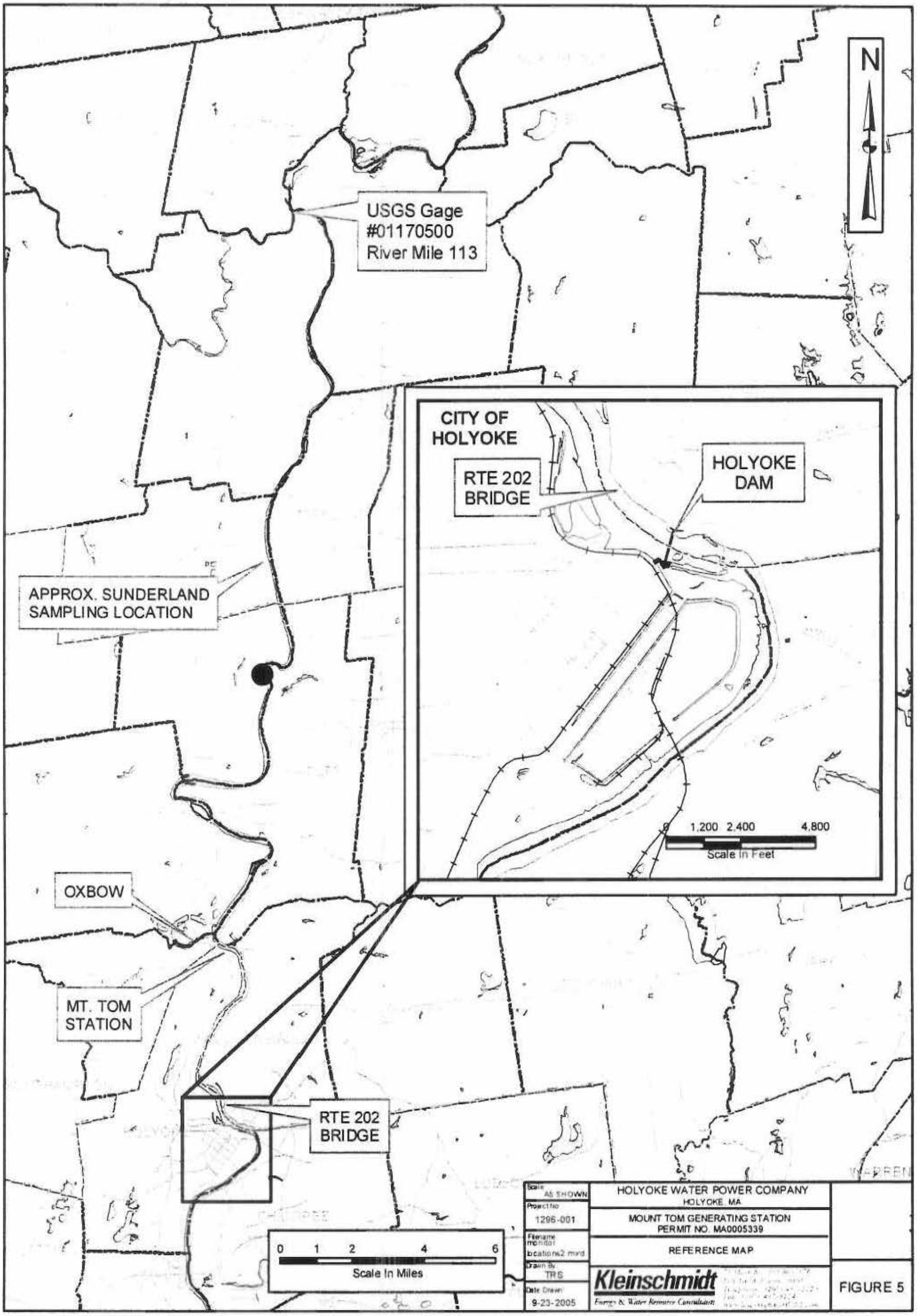


FIGURE 4
MOUNT TOM GENERATING STATION
COOLING WATER INTAKE STRUCTURE DATA

TITLE OF REFERENCE DRAWINGS	NUMBER
Circulating Water Piping - Sheet No. 1	6058-M-50
Circulating Water Piping - Sheet No. 2	6058-M-51
Station Cross Section	6058-M-130
Screenwell Plans	6058-S-61
Screenwell Sections	6058-S-62
Screenwell Details	6058-S-63

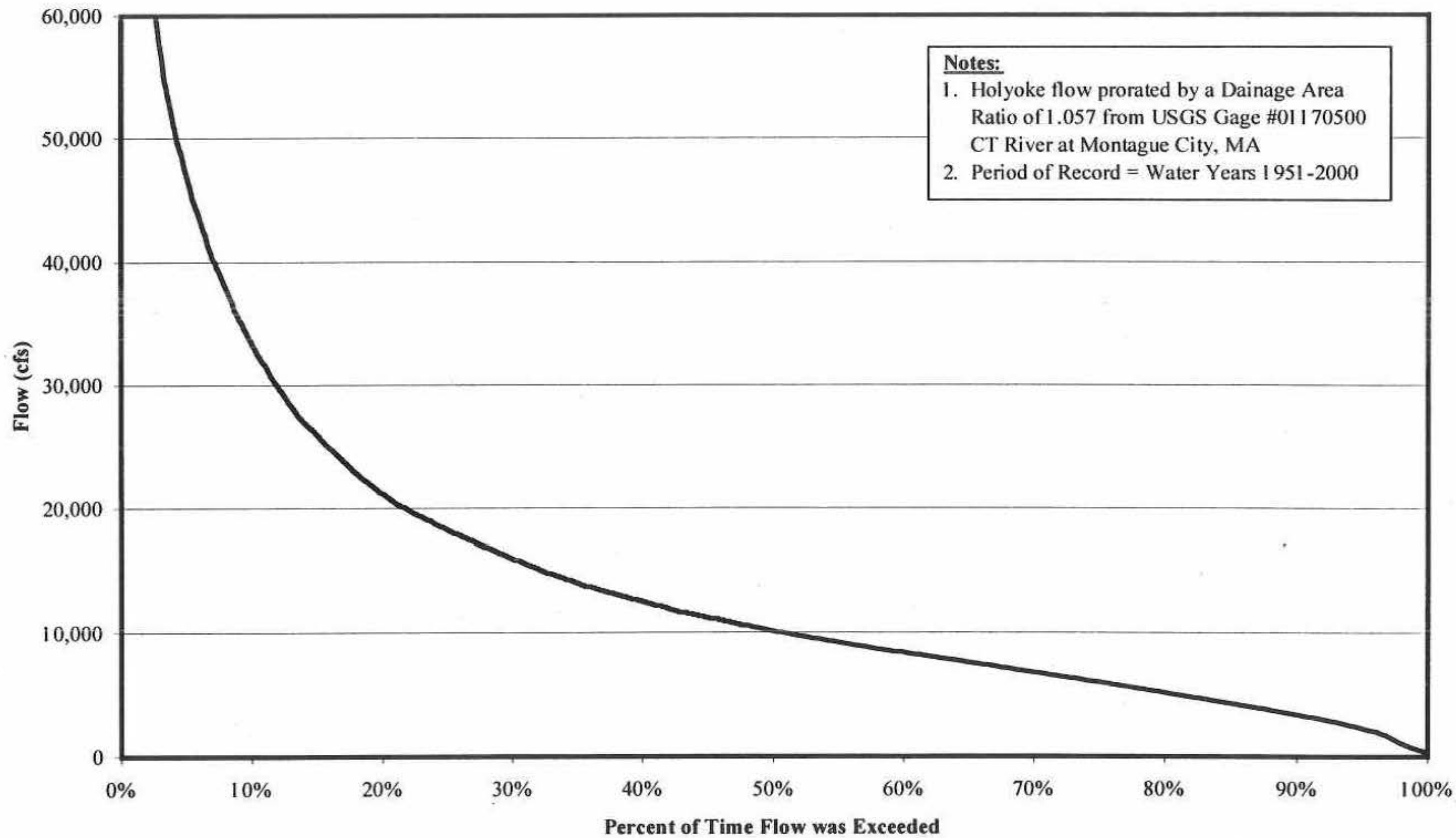
QUIPMENT LOCATION
OLYOKE WATER POWER CO.
LAND, INC., ENGINEERS BOSTON - NEW YORK
T TOM POWER PLANT — UNIT NO. 1
L HOUSE - GENERAL ARRANGEMENT
SCALE 1/8" IN. = 1 FOOT
6058-M-135
H. W. P. CO. FILE NO. 43719-27135


N
USGS Gage
#01170500
River Mile 113
CITY OF
HOLYOKE
RTE 202
BRIDGE
HOLYOKE
DAM
0 1,200 2,400 4,800
Scale In Feet
APPROX. SUNDERLAND
SAMPLING LOCATION
OXBOW
MT. TOM
STATION
RTE 202
BRIDGE
0 1 2 4 6
Scale In Miles
Scale AS SHOWN
Project No 1296-001
Filename monitor locations2.mxd
Drawn By TRS
Date Drawn 9-23-2005
HOLYOKE WATER POWER COMPANY
HOLYOKE, MA
MOUNT TOM GENERATING STATION
PERMIT NO. MA0005339
REFERENCE MAP
Kleinschmidt
Energy & Water Resource Consultants
FIGURE 5

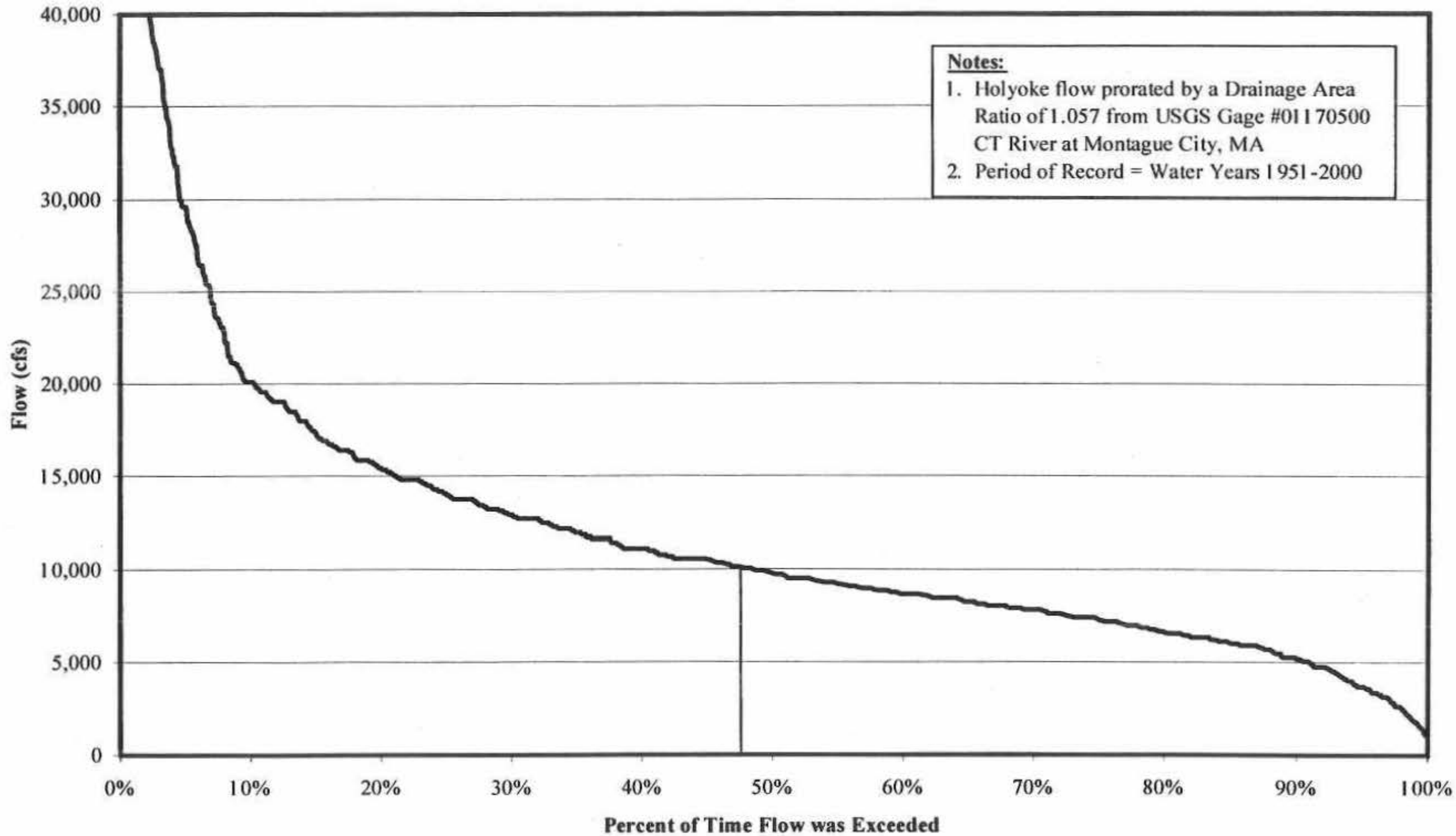
APPENDIX A

FLOW DURATION CURVES

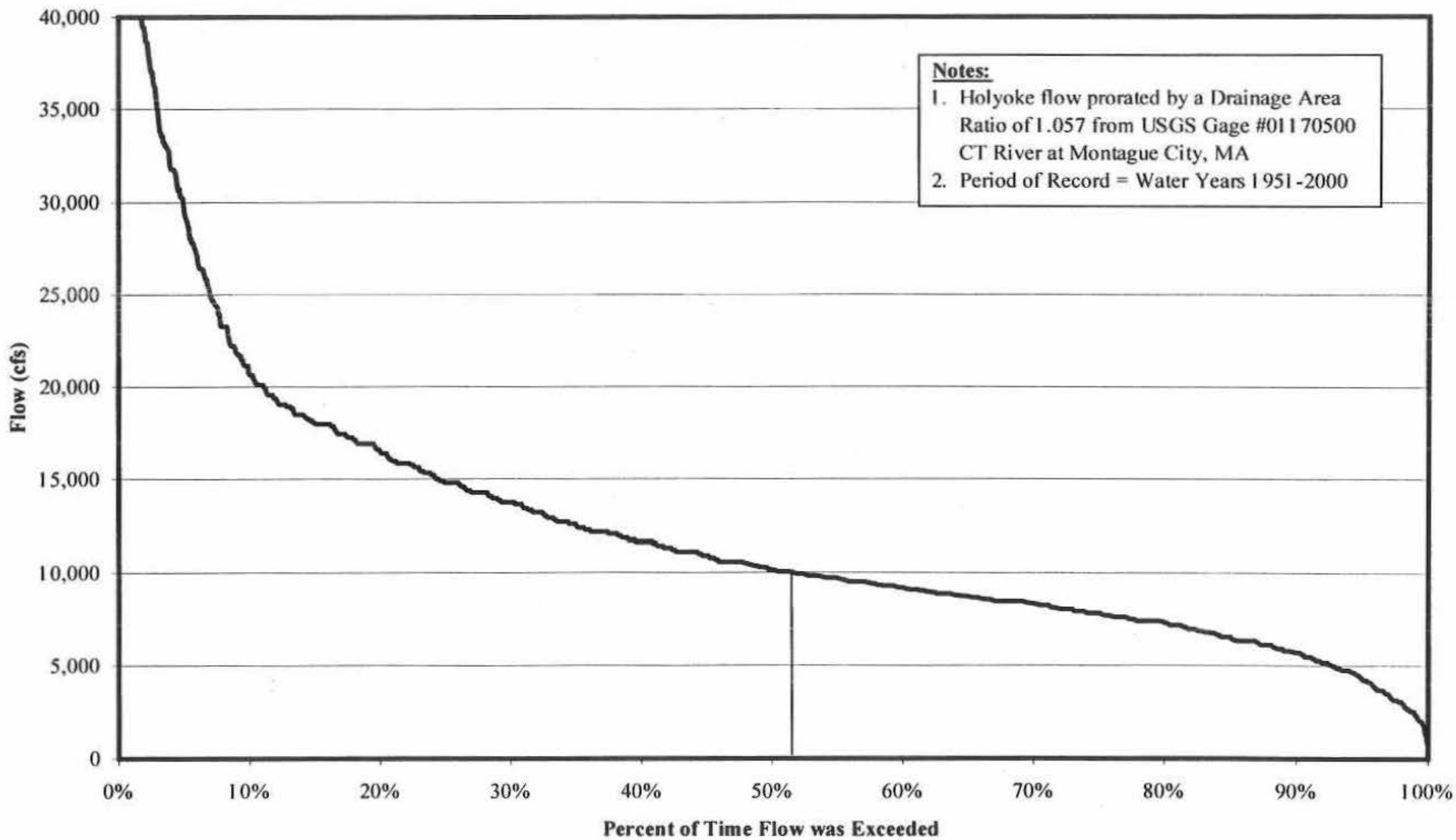
Holyoke Dam
Annual Flow Duration Curve



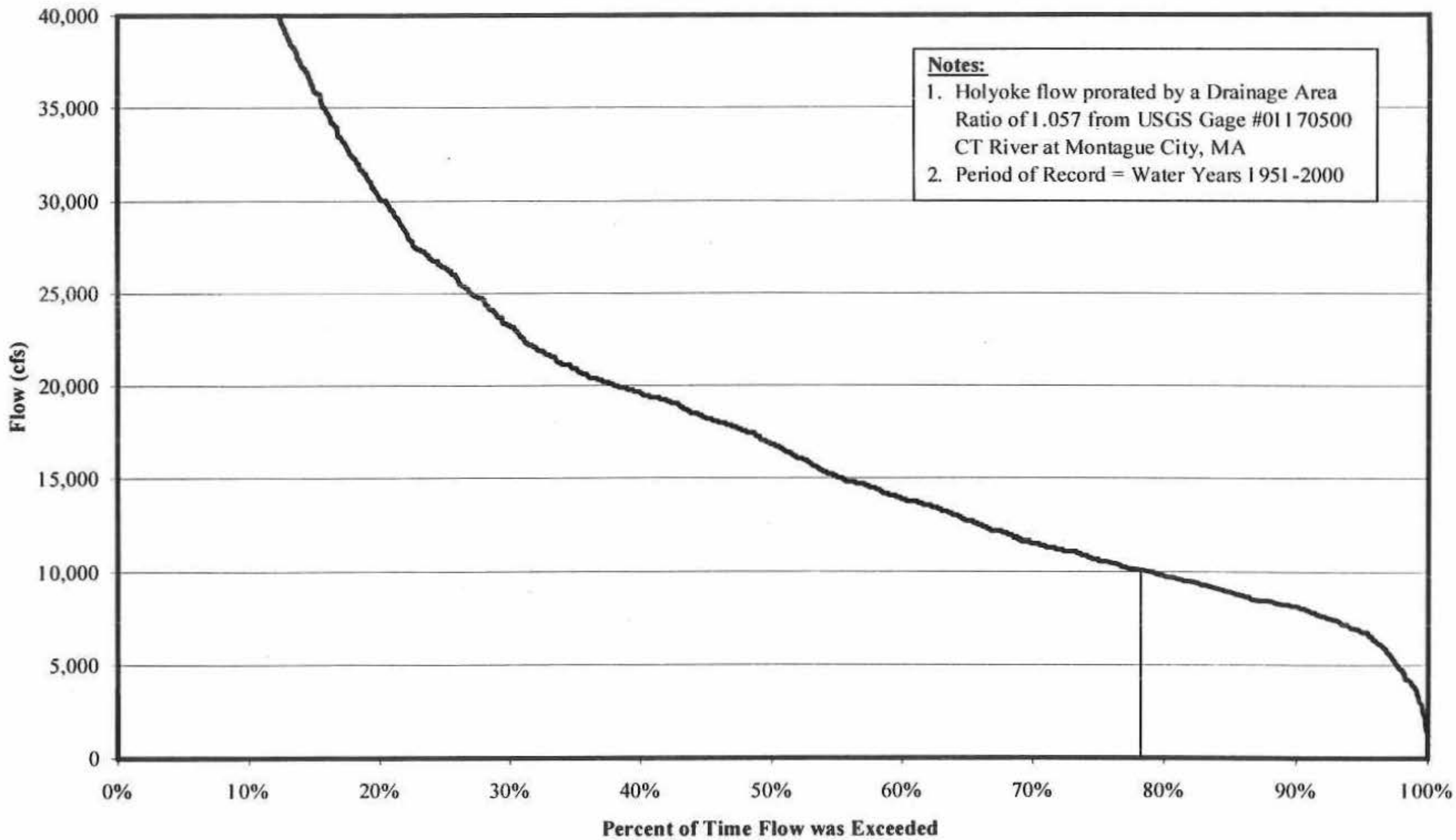
Holyoke Dam
January Flow Duration Curve



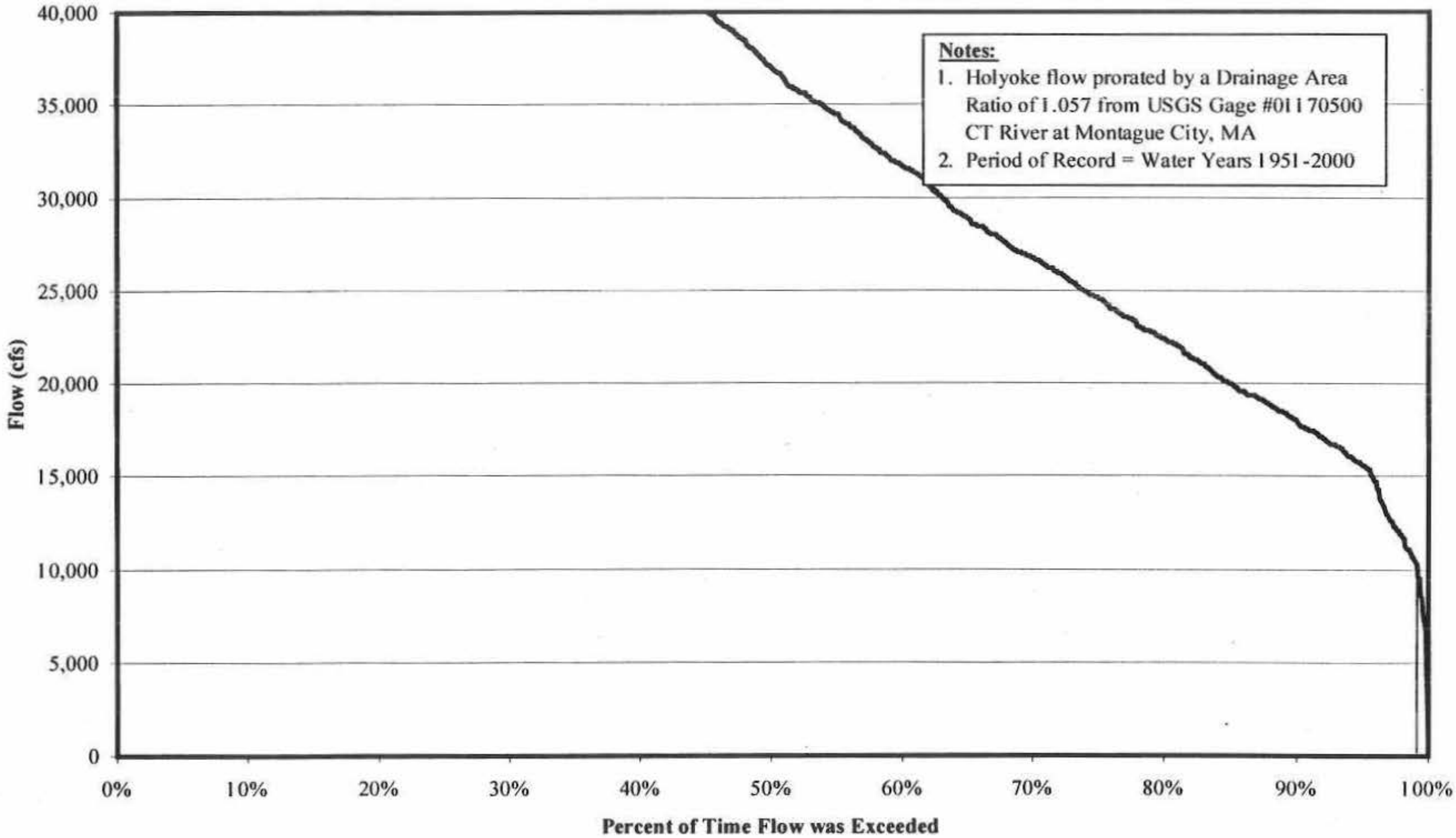
Holyoke Dam
February Flow Duration Curve



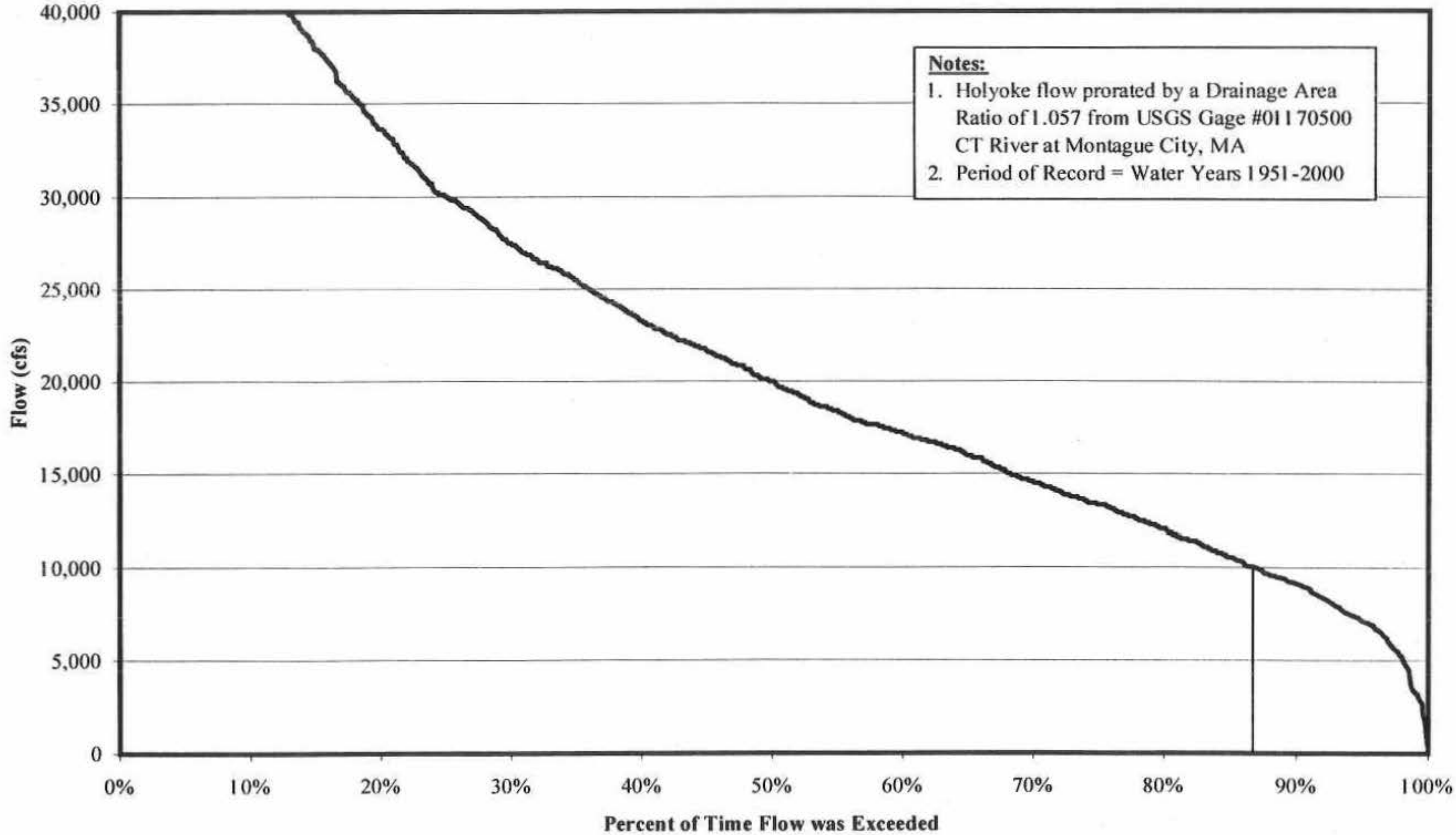
Holyoke Dam
March Flow Duration Curve

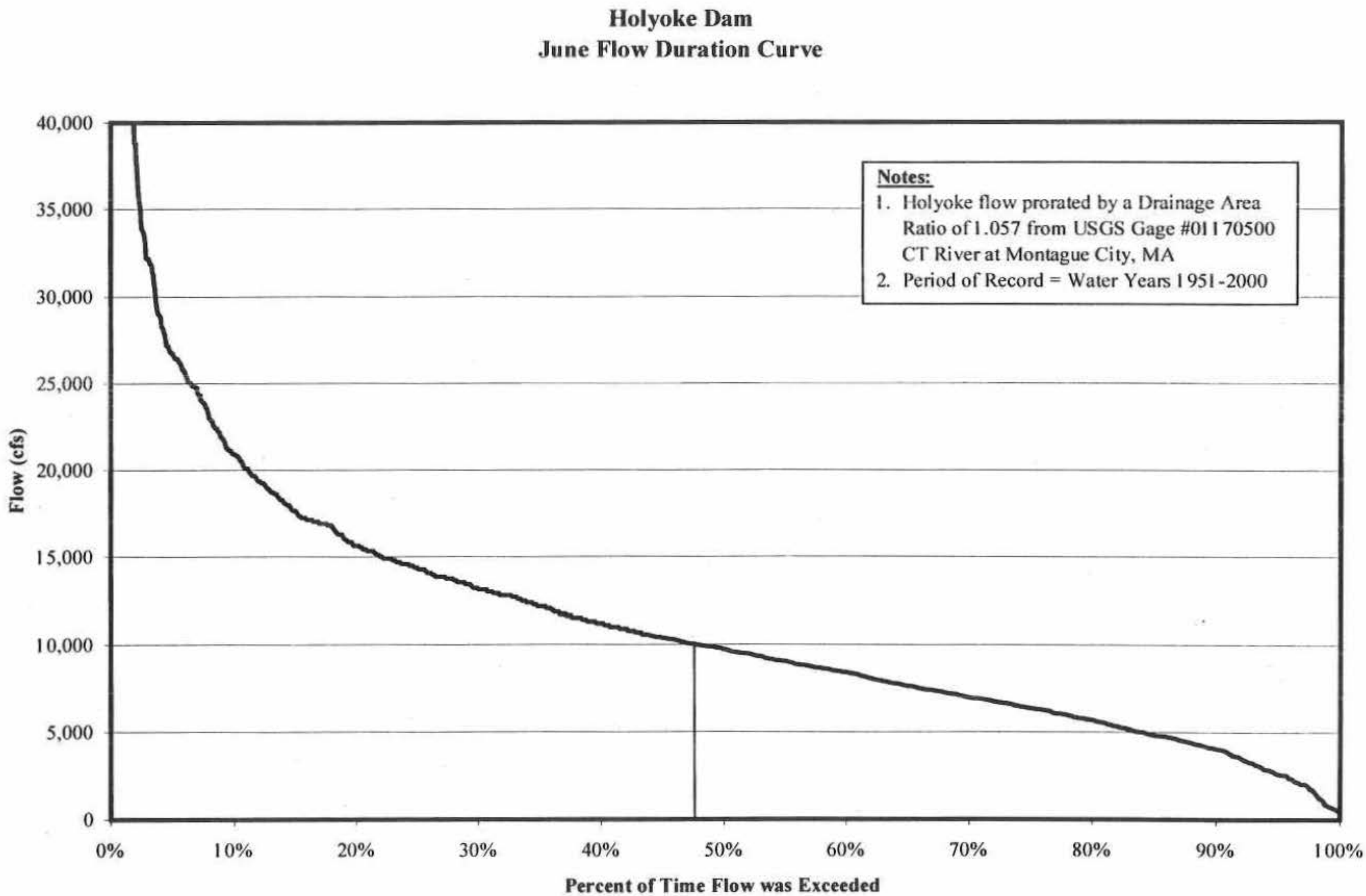


Holyoke Dam
April Flow Duration Curve

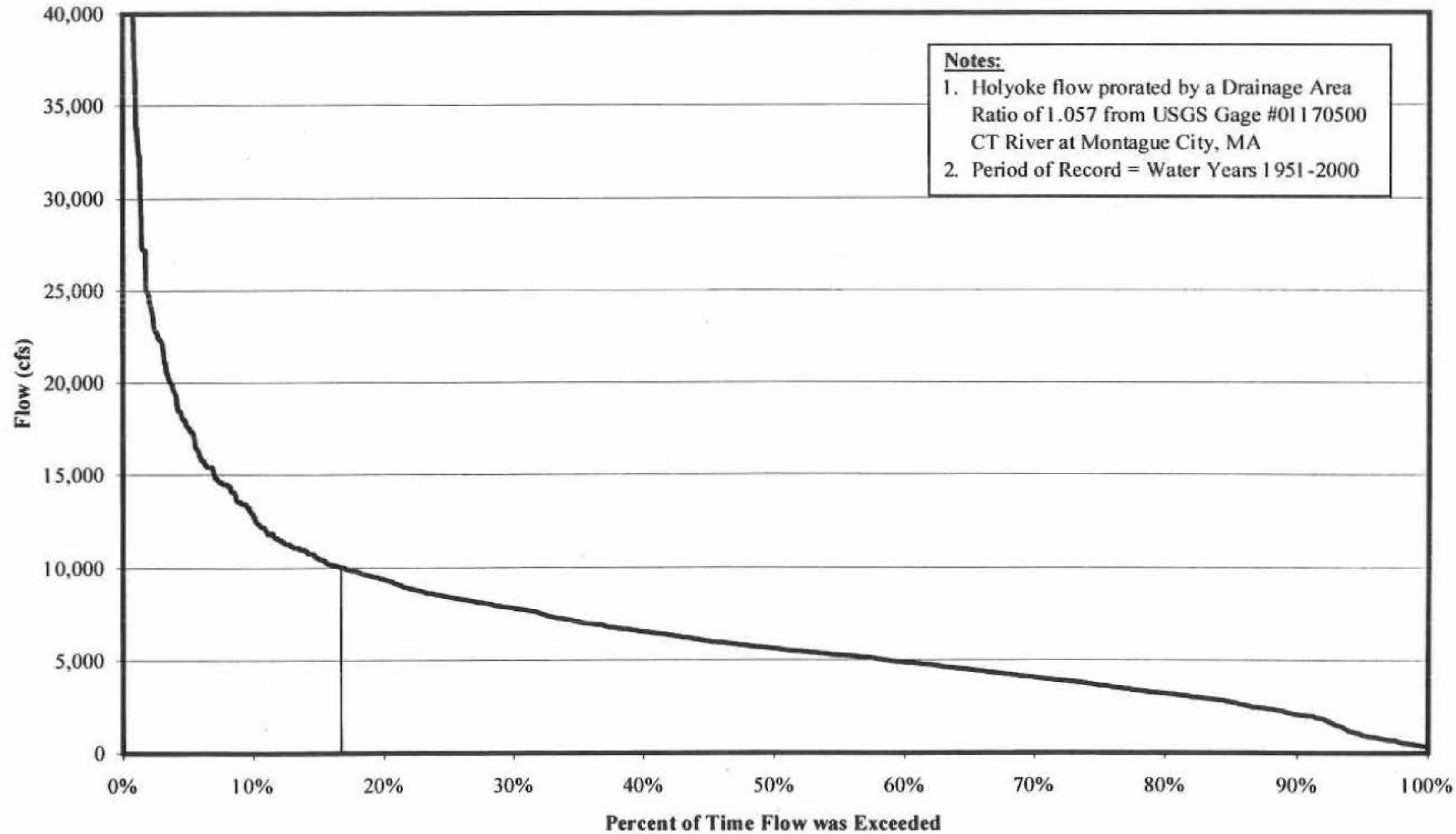


Holyoke Dam
May Flow Duration Curve



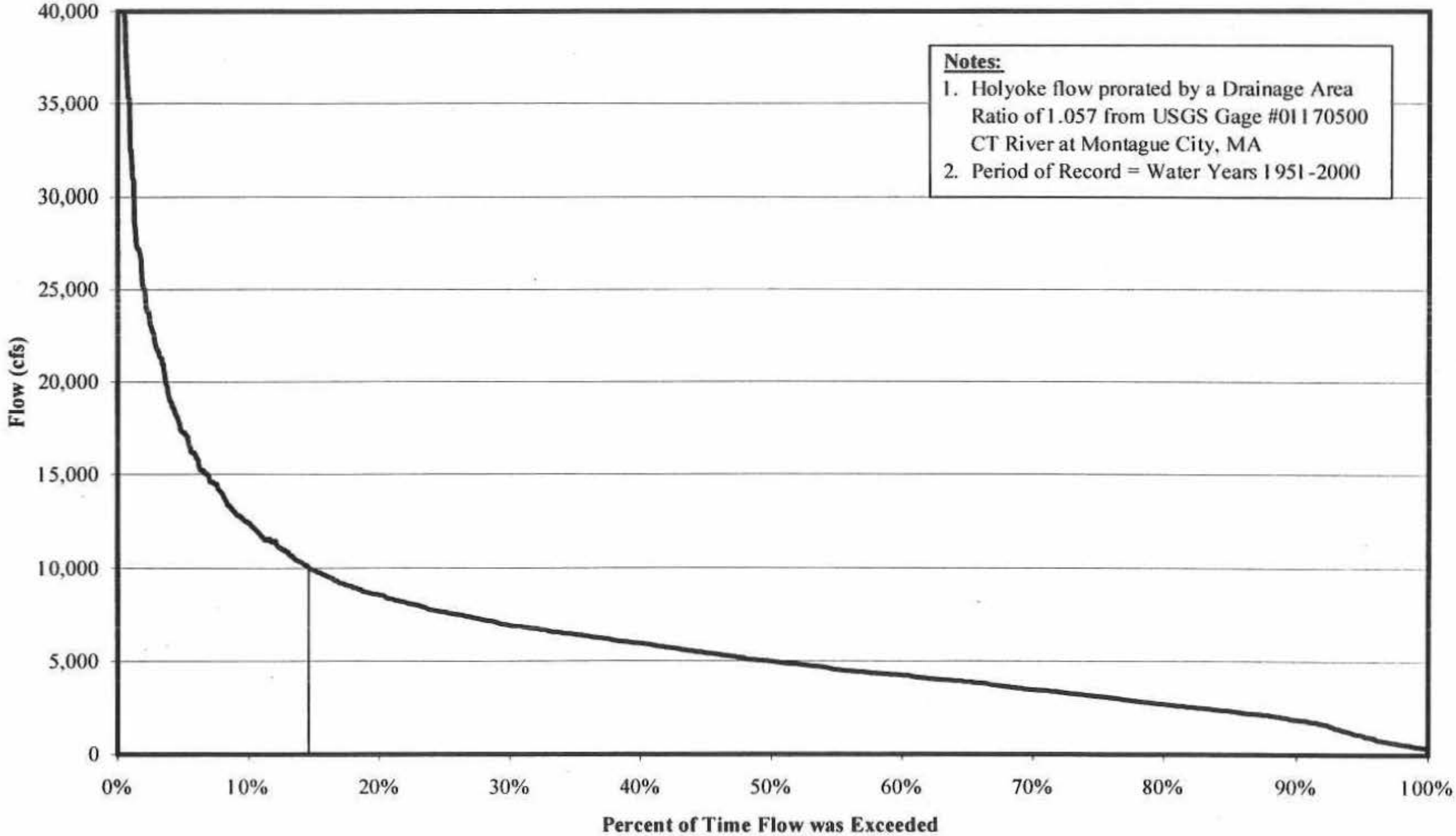

Holyoke Dam
June Flow Duration Curve
Notes:
1. Holyoke flow prorated by a Drainage Area Ratio of 1.057 from USGS Gage #01170500 CT River at Montague City, MA
2. Period of Record = Water Years 1951-2000
Flow (cfs)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Flow was Exceeded

Holyoke Dam
July Flow Duration Curve

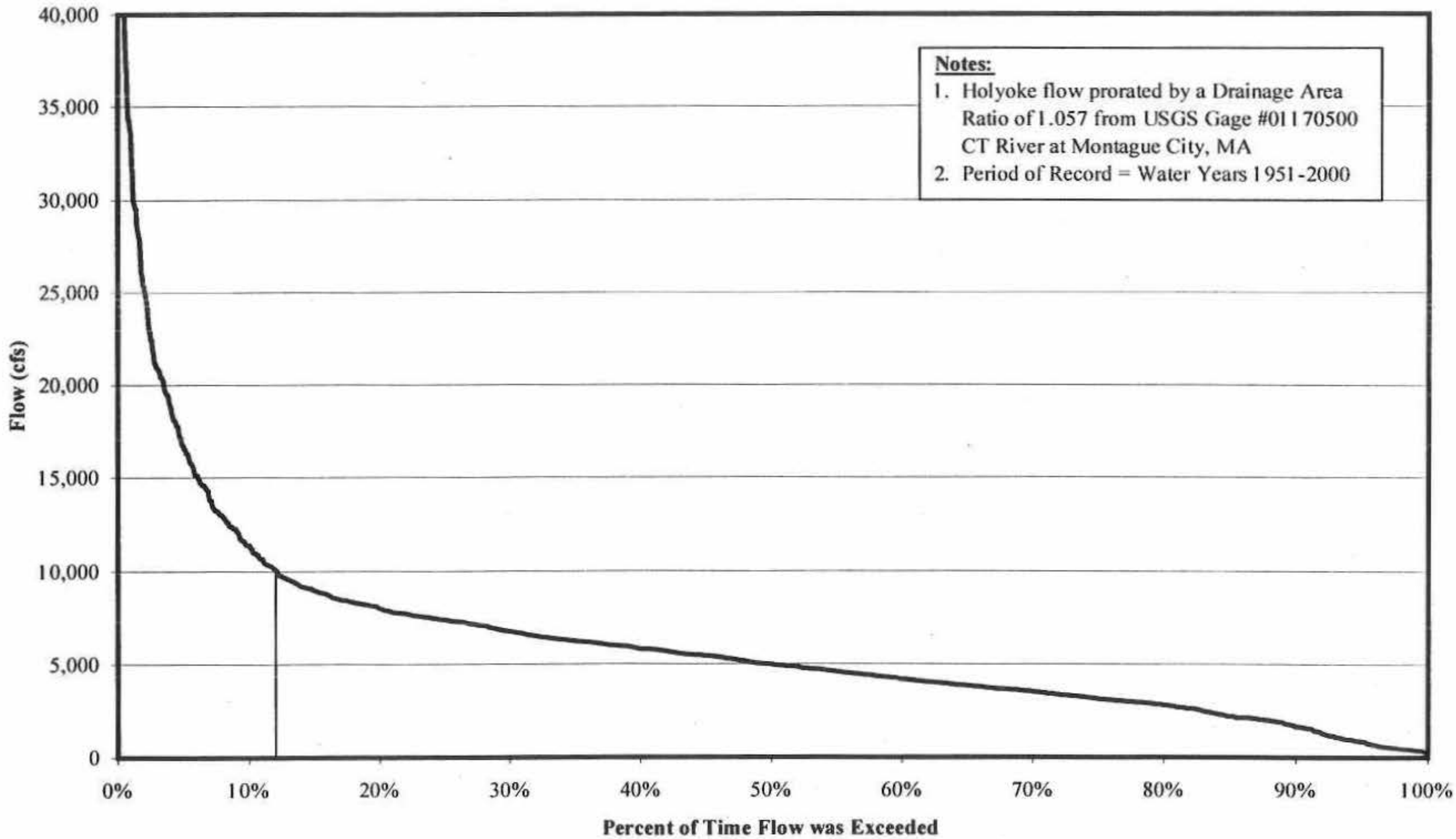


Holyoke Flow Duration Curves.xls

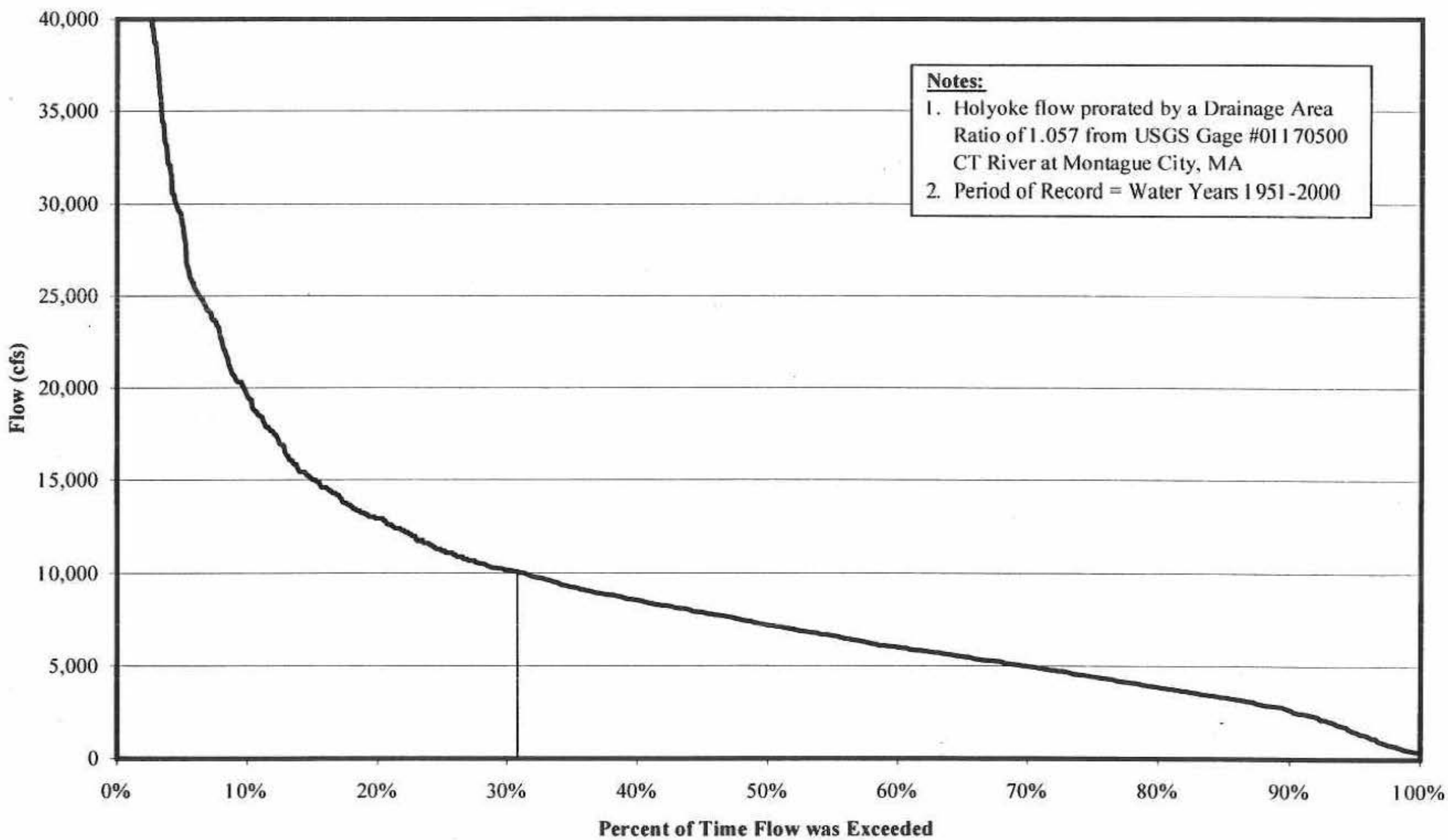
Holyoke Dam
August Flow Duration Curve



Holyoke Dam
September Flow Duration Curve

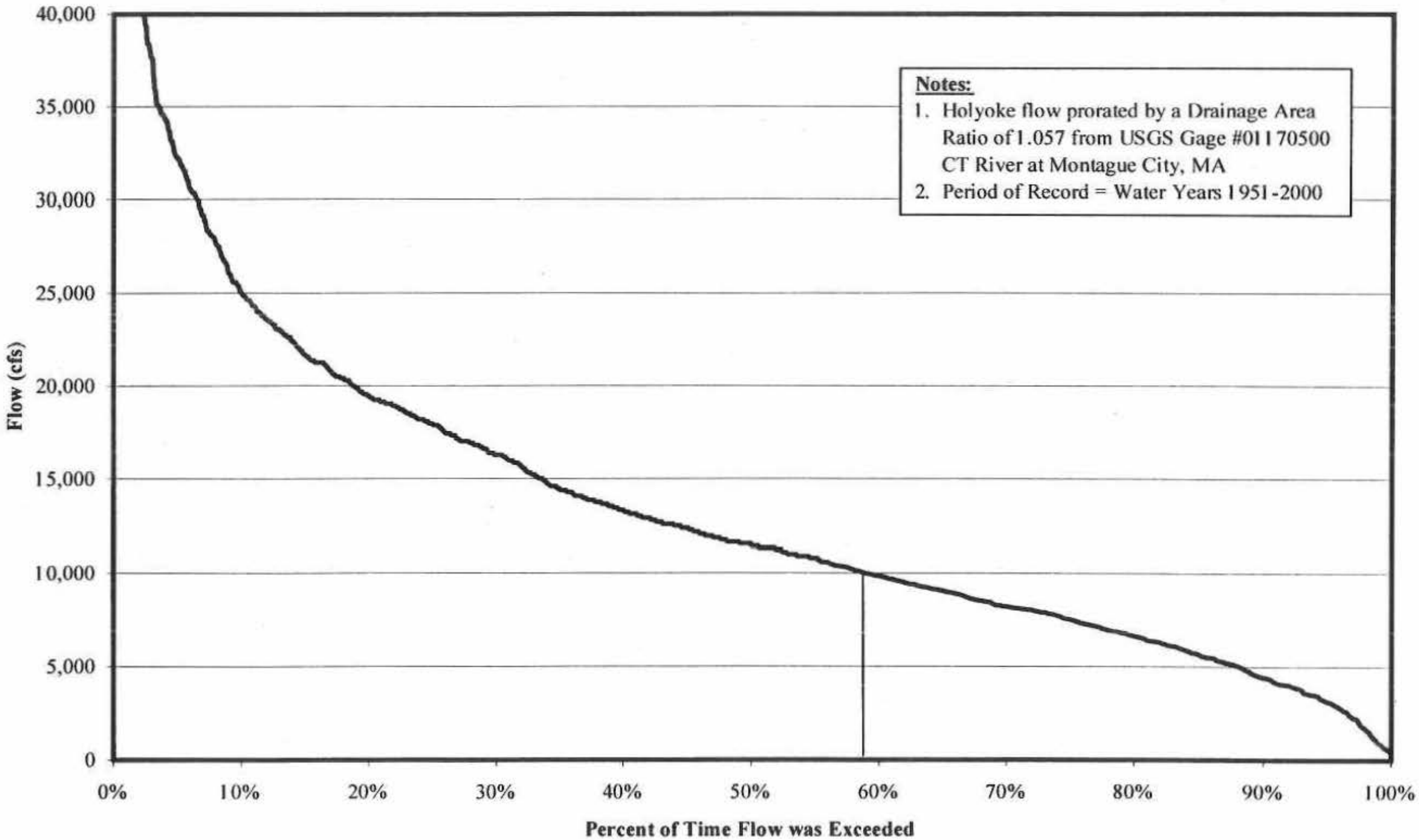


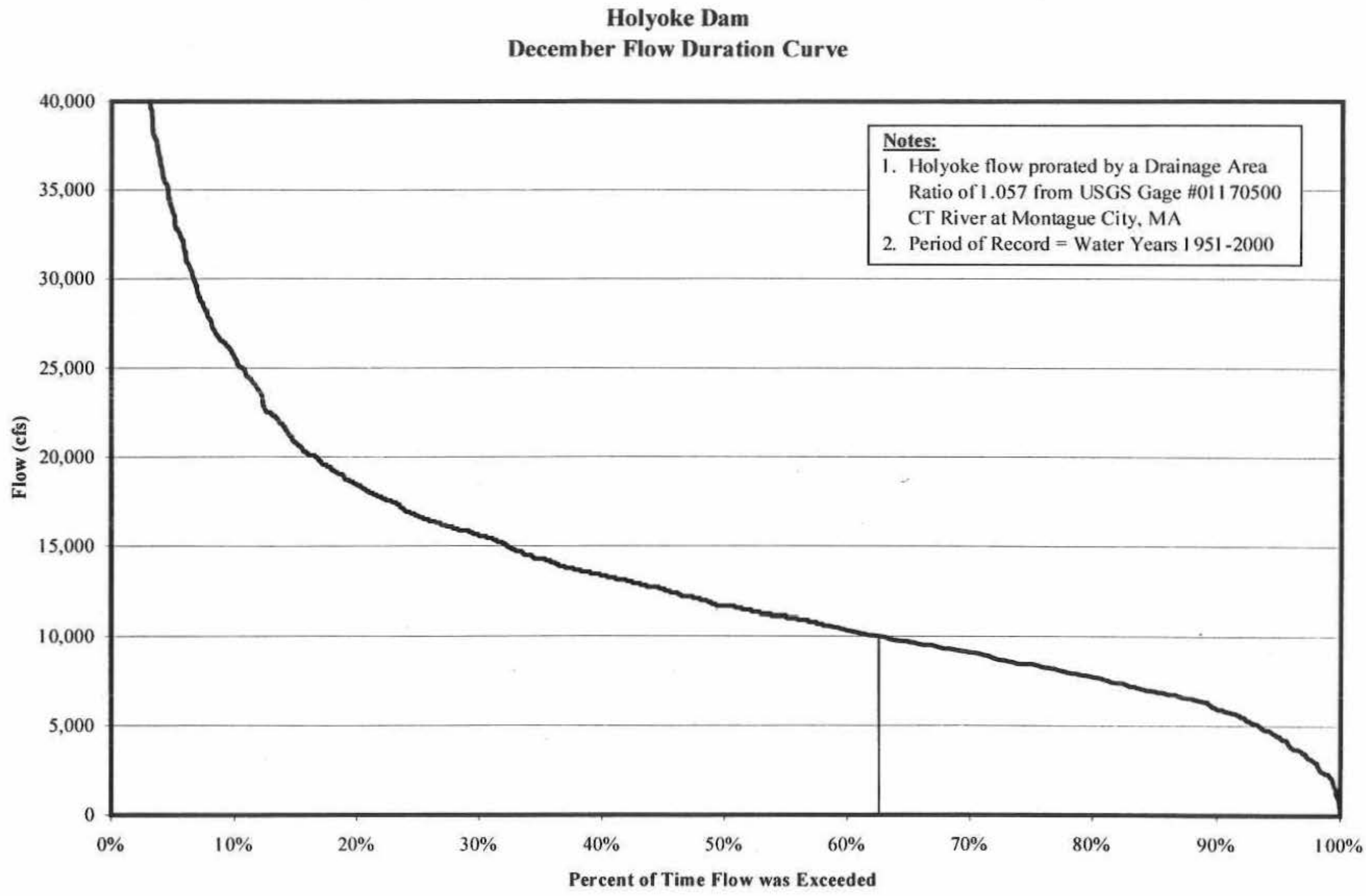
Holyoke Dam
October Flow Duration Curve



Holyoke Flow Duration Curves.xls

Holyoke Dam
November Flow Duration Curve




Holyoke Dam
December Flow Duration Curve
Notes:
1. Holyoke flow prorated by a Drainage Area Ratio of 1.057 from USGS Gage #01170500 CT River at Montague City, MA
2. Period of Record = Water Years 1951-2000
Flow (cfs)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Percent of Time Flow was Exceeded

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COOLING WATER INTAKE STRUCTURE DATA
40 CFR 122.21(r)(3)

August 2005

Prepared by:

Kleinschmidt

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COOLING WATER INTAKE STRUCTURE DATA
40 CFR 122.1 (r)(3)

September 2005

Prepared by:

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COOLING WATER INTAKE STRUCTURE DATA

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COOLING WATER INTAKE STRUCTURE DATA

EXECUTIVE SUMMARY

The following Cooling Water Intake Structure (CWIS) Data Report is being submitted to the Massachusetts Department of Environmental Protection (MA DEP) by Holyoke Water Power Company (HWPC) on behalf of the Mount Tom Generating Station (Mount Tom). The report complies with the U.S. Environmental Protection Agency (EPA) Clean Water Act 316(b) Phase II rule for required data to be submitted when Phase II facilities apply for a reissued NPDES permit. The following criteria to characterize the CWIS to assist in the evaluation of its potential for impingement and entrainment of aquatic organisms addresses the specific provisions of 40 CFR 122.21(r)(3).

1. A narrative description of the configuration of the CWIS and where the structure is located in the waterbody and in the water column;

2. Latitude and longitude in degrees, minutes, and seconds for the CWIS;

3. A narrative description of the operation of the CWIS, including design intake flows, daily hours of operation, number of days of the year in operation, and seasonal operation schedules, if applicable;

4. A flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges; and

5. Engineering drawings of the cooling water intake structure.

1.0 RULE APPLICABILITY

1.1 Definition of a Phase II Existing Facility

The U.S. EPA has published final regulations under Clean Water Act (CWA) §316(b) establishing requirements for cooling water intake structures at Phase II Existing Facilities (EPA, 2004). The regulations apply to power generation stations that qualify as Phase II Existing Facilities based on the following criteria as described in Sections §125.91 and §125.93 of the 316(b) Rule (EPA, 2004):

- The facility is a point source that uses or proposes to use one or more CWIS(s) that withdraw(s) cooling water from waters of the United States,
- The CWIS has a total design intake flow greater than or equal to 50 million gallons per day (MGD),
- The facility's primary activity is to generate electric power,
- The facility uses at least 25 percent of the withdrawn water exclusively for cooling purposes, and
- The facility's construction started on or before January 17, 2002.

A facility must comply with the 316(b) regulations in order to renew its National Pollutant Discharge Elimination System (NPDES) permit. Under 316(b) regulations, compliance generally requires a facility to reduce its impingement mortality by 80 to 95 percent and, if applicable, its entrainment by 60 to 90 percent from calculation baseline.

1.2 Mount Tom Applicability Assessment

Mount Tom qualifies as a Phase II facility for the following reasons:

- Mount Tom's primary activity is to generate electric power.
- Mount Tom is a point source that uses a CWIS to withdraw cooling water from the Connecticut River, a water of the United States.
- Mount Tom uses more than 25 percent of the withdrawn water for cooling purposes.
- Mount Tom's total design intake flow is greater than 50 MGD.
- Mount Tom began commercial operation in 1960.

The five-year average annual flow of the Connecticut River as measured by the USGS gauge located in Montague City, MA (approximately 30 river miles upstream of Mount Tom) is approximately 9,264 MGD (14,334 cubic feet per second). The design intake flow at Mount Tom is 133.2 MGD. Therefore, comparing the design intake flow of Mount Tom to the five-year annual average river flow indicates that Mount Tom only withdraws approximately 1.4% of the Connecticut River mean annual flow. Since this is less than 5%, Mount Tom is exempt from the entrainment reduction standard.

The design through-screen intake velocity at each of the Mount Tom traveling screens is 1.7 fps, therefore the impingement mortality reduction standard applies and Mount Tom is required to reduce impingement mortality by 80 to 95% from baseline levels.

The description contained within this document, accompanied by the drawings of the intake structure, addresses the five criteria listed above.

A review of the 316(b) rule applicability criteria indicates that Mount Tom qualifies as a Phase II facility: its cooling water intake design flow exceeds 50 MGD; its primary activity is to generate electricity; at least 25% of the water withdrawn is used exclusively for cooling water purposes; and the station was constructed prior to January 17, 2002.

While the Station qualifies as a Phase II facility, applicability of the impingement mortality and entrainment reduction standards varies by source water body classification and intake design. Cooling water is withdrawn from the Connecticut River, which is classified as a freshwater river at Mount Tom.

2.0 COOLING WATER INTAKE DESCRIPTIONS

2.1 CWIS Location

Mount Tom is located in central Massachusetts along the western banks of the Connecticut River in the town of Holyoke, Massachusetts (Figure 1). Mount Tom consists of a single, coal-fired unit with a net generating capacity of 147 megawatts electric (MWe).

Mount Tom Station has one, submerged-type cooling water intake structure to provide cooling water to the plant's once-through cooling systems. The CWIS is located on the western shore, on a S-curve in the Connecticut River and is oriented parallel to flow.

The water drawn from the Connecticut River enters the station through a single CWIS at the plant's eastern end that is located at 42°-16′-55″ N Latitude and 72°-36′-15″ W Longitude. After absorbing heat in the plant condenser and auxiliary heat exchangers, the cooling water is discharged back into the river via a surface-type outfall that is oriented parallel to the river, several hundred feet downstream of the intake.

River water enters the submerged CWIS (screenwell structure) through an 8-foot (inside) diameter concrete intake pipe approximately 30 feet from the river's bank. The screenwell structure floor elevation is 85'-0" at the location of the traveling screens. The CWIS inlet pipe invert elevation is 87'-0" in the river. Figures 2, 3 and 4 show the relationship of the intake pipe and CWIS to their location in the Connecticut River water column. Other water level elevations are noted below (Chain Belt Co., 1958).

- Minimum Low Water 98'-0" feet
- Average Water 102'-6" feet
- Normal Annual High Water 112'-0" feet
- Extreme High Water 128'-0" feet

2.2 CWIS Configuration

The non-contact cooling water drawn from the Connecticut River enters the station through the 8-foot diameter, 345 foot-long concrete intake pipe. A series of seven, evenly spaced, 4" diameter, brass vertical bars are installed in concrete sleeves, directly in front of the inlet to the 8-foot diameter pipe to preclude large debris from entering the cooling water system. Located immediately behind the brass bars is an electric fish screen, consisting of eight vertical electrodes. The fish screen was installed when Mount Tom went on-line in 1960.

The 8-foot diameter intake pipe lies south to an adjacent man-made, concrete jetty (Figure 2). A 5-foot tall (above river bottom), sheetpile curtain wall is radially directed in a southerly direction in front of the pipe inlet, from the northern outer-most point of the jetty to a point past the intake pipe. It is located approximately 20 feet in front of the intake and helps preclude fish and debris from entering the intake pipe.

From the river, the pipe runs underground in a westerly direction from invert elevation 87'-0" to invert elevation 90'-0" where it connects into the screenwell structure. The screenwell structure contains the trash racks, traveling screens and cooling water pumps (Figure 4).

The roof of the screenwell structure is located at grade elevation (129'-4"), within the plant switchyard area. The remainder of the structure is below grade, and the floor of the structure is at elevation 85'-0". The entrance section of the screenwell structure is vertically divided into two symmetrical sections, or bays, with each bay containing one vertical trash rack and one vertical flow-through traveling screen. Water enters the first compartment of the screenwell structure and splits into the two bays, separated by a concrete pier. After cooling water passes through the trash racks, it enters the traveling screen compartment via an 8' x 8' square sluiceway (with sluice gate) to the front of the traveling screen. After passing through the screen, water is separately drawn into the suction side of the Circulating Water and River Water pumps. The pumps are located in the screenwell structure in a pump bay that is separate from the traveling screens. The Circulating Water and River Water pumps each have their own separate suction inlets, which are designed integral to the downstream side of the traveling screens (Figures 5 and 6).

The Circulating Water pumps, River Water pumps and Screen Wash pumps are accessible in the pump bay. Access to each of the traveling screens and trash racks is by a manway in the roof structure, and a ladder runs to the base of the compartments. The pump bay is accessed via a stairway.

The traveling screens are mounted flush with the screen supporting walls, and extend to the floor of the intake structure at invert elevation 85'-0". Both operating traveling screens have 3/8-inch x 3/8-inch mesh and intercept material greater than this opening. The traveling screens are Chain Belt Company Model No. 6T-24P-3/8 S.B. The screens are vertical, chain-drive, single speed and are rated for 50,000 gpm each at a water depth of 15 feet. The screens span the entire height of the screenwell structure. The motor/drive assemblies and debris removal sections of the screens are exposed above grade elevation for operation and maintenance accessibility. Screen travel speed is approximately 10 feet per minute.

Each traveling screen is dedicated to one Circulating and River Water pump, that is, traveling screen No. 1-1 is used with Circulating Water pump No. 1-1 and River Water pump No. 1-1 and cannot be used with Circulating Water pump No. 1-2 or River Water pump No. 1-2. If a traveling screen is taken out of service for maintenance, then the corresponding Circulating Water and River Water pumps are not operated. Normally, the 8' x 8' sluice gate is in the open position. Closing the sluice gate isolates the traveling screen to permit maintenance and inspection activities to be performed to the screens in the screenwell structure. The number of traveling screens operating and screen operating duration is variable, depending on the amount of debris in the river. Only one screen is backwashed at any given time.

The traveling screens are cleaned with the Screen Wash system. Water for the Screen Wash System is provided by two, 250 gpm, 70 psi rated Screen Wash pumps. The pumps are installed in the screenwell structure pump bay, are connected (piped) in parallel and have a common discharge line that permits either pump to wash either traveling screen. When the Screen Wash pumps operate, they withdraw water from the discharge side of the Circulating Water pumps through a 6" suction pipe and pump it to the traveling screen in a 4" discharge pipe. Normally, one pump is operating while the other pump is in standby.

The pressure spray from the pumps is directed outward towards the screen and washes debris and any impinged fish into an adjacent debris trough. The spray water also serves to sluice away the screened material. The debris and spray water is directed into a smooth, half-open sluiceway to a point immediately outside of the switchyard. At this point there is a large drop-off into a culvert. Sluiced material runs down the culvert into a partially open manway. A pipe from the manway discharges the debris to the Connecticut River (Outfall 005), downstream of the station discharge (Outfall 001).

The station frequently has operating problems with the Screen Wash pumps and system, so the fire pumps are mostly used to wash debris from the traveling screens when the screens begin to clog. The fire pump withdraws water from the plant's cooling water discharge pipe and discharges it to the Spray Wash system screen spray nozzles. The flow and pressure from the fire pump is throttled to a level commensurate with removing the debris from the screens.

Historically, heavy trash buildup does not occur at Mount Tom, so screen rotation is manually actuated several times each day as needed. High trash volumes occur mostly during storms or in the fall when leaves drift downriver. The traveling screens are not cleaned continuously when they are operated. Each screen is operated on a periodic basis. The traveling screens do not have fish buckets (e.g., Ristroph type).

The two, 100% capacity, 45,000 gpm Circulating Water pumps, No.'s 1-1 and 1-2 are located inside the screenwell structure pump bay. The discharge pipes from each pump combines into a common header upstream of the steam surface condenser. Water leaving the condenser runs in a common header/discharge tunnel where the heated water is returned to the Connecticut River (Outfall 001), several hundred feet downstream of the cooling water intake. This discharge is directed downstream (south) in the river by a permanently installed sheet piling curtain wall.

The number of pumps operating depends on Connecticut River water temperature and/or plant operating capacity. In the summer months, normally both Circulating Water pumps are operating. The number of Circulating Water pumps operating during the winter season varies depending on river water temperature and plant operating capacity. When the Circulating Water system is in operation, at least one Circulating Water pump will be operating, and the intake structure is considered to be in operation. Circulating water (cooling water system) pump historical operating data is provided in the Cooling Water System Data Report (40 CFR 122.21(r)(5)) for Mount Tom Station.

The two, 100% capacity, 2,500 gpm River Water pumps, No.'s 1-1 and 1-2 are also located inside the screenwell structure pump bay. Only one of these pumps operates at a time, while the other pump is in standby. After the river water has absorbed heat in the plant auxiliary heat exchangers, it is discharged into the 8-foot diameter Circulating Water discharge pipe, at a point downstream of the main surface condenser. Table 1 details the design pump capacity of the Circulating Water and River Water pumps.

The recirculation system is used during the winter season if ice is forming in the CWIS. The recirculation line is underground and connects the 8-foot diameter cooling water inlet pipe with the 8-foot diameter cooling water discharge pipe. A portion of circulating water that has absorbed heat in the condensers is forwarded from the discharge pipe back to the 8-foot diameter inlet pipe by way of a cross-over pipe located upstream of the screenwell structure. Flow through the recirculation line is controlled by opening a manually operated gate valve to allow enough flow to perform the necessary deicing of the water entering the screenwell structure. This recirculation flow results in a small reduction in overall plant cooling water inlet flows, but is considered insignificant compared to overall cooling water design flow because the recirculation system is not frequently used. A water balance diagram for the Mount Tom facility is shown in Figure 7. This diagram shows all the flows entering and leaving the facility, including non-contact cooling water.

To control biofouling of the condensers and other cooling water plant piping and equipment, a sodium hypochlorite solution is injected into the Circulating Water system for up to two hours per day. The injection point is located upstream of the trash racks and traveling screens within the screenwell structure.

2.3 CWIS Traveling Screen Inlet Velocity

The traveling screens at Mount Tom are Chain Belt Company Model H-16522, with #12 W&M copper wire screen cloth and 3/8" square openings. This screen will have a velocity of 1.5 fps at a flow of approximately 50,000 gpm at a low water depth of 15 feet (Chain Belt Co., 1958).

The CWIS through-screen inlet velocity at the traveling screens is dependent on the amount of cooling water flow being supplied to the plant, water level at the traveling screens and the design of the traveling screen. Since one Circulating Water and one River Water pump is dedicated to one traveling screen, the design through-screen velocity occurs when both of these pumps are operating and the CWIS (screenwell structure) water level is at the design low water depth of 13 feet. The design low water depth is from design low water elevation 98-0" to the base floor of the screenwell structure elevation 85'-0" (Figure 4).

For each traveling screen, the design through-screen velocity is 1.7 feet per second (fps) at the design flow of 47,500 gpm. The design flow is achieved with the operation of one Circulating Water pump (rated at 45,000 gpm) and one River Water pump (rated at 2,500 gpm). Therefore, since the through-screen velocity exceeds the allowable maximum of 0.5 fps, Mount Tom is subject to meeting the 316(b) impingement mortality reductions.

The 8-foot diameter concrete inlet pipe at Mount Tom was designed to manage the operation of both Circulating Water pumps and one River Water pump. The combined flow for this condition is 92,500 gpm. Based on this flow, the intake velocity at the inlet to the pipe in the Connecticut River is 4.1 fps.

Through-screen velocities were calculated based on the following equation (EPA, 2004b):

$$\text{Velocity at Screen} = \frac{\text{Design Flow (cfs)}}{\text{Screen Width (ft) x Low Water Depth (ft) x \% Open Area}}$$

where:

- screen width is 10 feet;
- design low water depth is 13 feet;
- % open area is 50.66% (Petrovs, 2005); and
- design flow is 47,500 gpm.

Intake pipe velocity was calculated by V = Q / A (Crane, 1991),

where:

- Q = flow rate of 92,500 gpm (2 Circulating Water pumps and 1 River Water pump), 206.11 cfs
- A = cross-sectional area of pipe (ID) in feet.

3.0 REFERENCES

Chain Belt Co. Dwg. No. H16522-1, Rev. 1, dated 3-27-58, General Arrangement of Two Four Post Type Traveling Water Screens 6T-24P-3/8 S.B.", for Mt. Tom.

Crane Technical Bulletin 410, 1991, "Flow of Fluids Through Valves and Fittings", 25th printing.

Electric Fish Screen Co. Dwg. No. 59-100 Sheet 2 of 2, dated 2-10-59, "Electric Fish screen HWPC"

HWPC Dwg. No. 6058-M-84, Rev. 2, dated 2-10-59, "River Water Cooling Piping Sheet 1"

HWPC Dwg. No. 6058-M-135, Rev. 2, dated 10-3-59, "Screen Well House – General Arrangement".

HWPC Dwg. No. 6058-M-152, Rev. 4, dated 6-20-61, "Flow Diagram Cooling Water SH. No. 1"

HWPC Dwg. No. 6058-M-163, Rev. 7, dated 6-20-61, "Flow Diagram Circulating Water"

HWPC Dwg. No. 6058-M-185, dated 5-27-58, Mt. Tom Power Plant Unit #1 Station Heat Balance 148,480 KW"

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HWPC Dwg. No. 6058-M-242, Rev. 3, dated 7-17-61, "Piping Screen Well House SH. 2".

HWPC Dwg. No. 6058-S-65, Rev. 3, dated 6-19-59, "Intake & Discharge in Yard".

HWPC Dwg. No. PMAC-37, "River Cross Sections at Intake".

Kynard, B., M. Horgan, and E. Theiss. 2003. Spatial Distribution and jumping of Juvenile Shads in the Connecticut River, Massachusetts during Seaward Migration. Journal of Ichthyology 43:228-236.

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National Pollutant Discharge Elimination System (NPDES) permit, Permit #MA0005339 State Permit No. 278, receiving water Connecticut River.

National Pollutant Discharge Elimination System (NPDES) Discharge Monitoring Report (DMR), Once-Through Cooling Water Flows, Mt. Tom Station Permit No. MA0005339 from Jan-00 through Dec. 04.

National Pollutant Discharge Elimination System (NPDES) Permit Monitoring Record, HWPC Mt. Tom Station MA0005339 for Cooling Water Intake Flows from Jan-00 through Dec. 04.

National Pollutant Discharge Elimination System (NPDES) Permit Monitoring Record, HWPC Mt. Tom Station MA0005339 for Discharges No. 002, 005, 007, 008/009, 010/011 from Jan-00 through Dec. 04.

Northeast Utilities System Dwg. No. 43719-96004, Rev. 2, dated 04/05, "Mt. Tom Station SPCC Plan".

Petrovs, Henry, 2005, Telecomm from USFilter to Kleinschmidt Associates, Re: Basket Efficient for Rex Carbon Steel Basket.

U. S. Environmental Protection Agency (EPA). 2004. National Pollutant Discharge Elimination System-Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities; Final Rule. Federal Register Vol. 69, No. 131 (Friday, July 9):41,576-41,693.

U. S. Environmental Protection Agency. 2004a. Regional analysis document for the final Section 316(b) Phase II existing facilities rule.

U. S. Environmental Protection Agency. 2004b. Technical Development document for the final Section 316(b) Phase II existing facilities rule.

US Environmental Protection Agency. Region 1, Fact Sheet for HWPC Mt. Tom Station, Draft National Pollutant Discharge Elimination System (NPDES), Permit #MA0005339 State Permit No. 278, receiving water Connecticut River.

APPENDIX A

TABLE AND FIGURES

Table 1. Mount Tom Station Design Cooling Water Intake Flows

	Design Intake Flow		
	gpm	cfs	MGD
Circulating Water Pumps (2)	90,000	200.5	129.6
River Water Pump (1)	2,500	5.6	3.6
Total	92,500	206.1	133.2

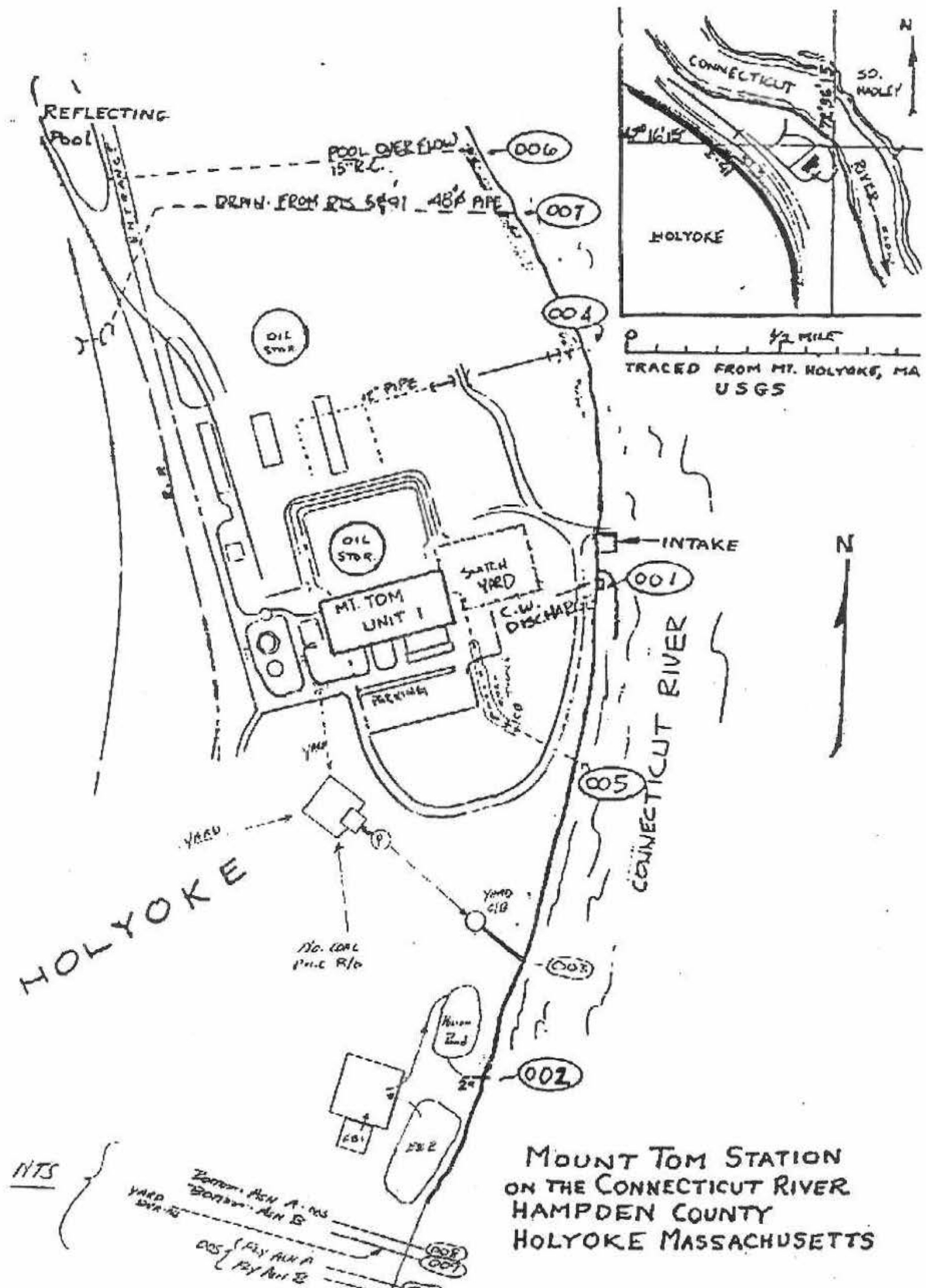


Figure 1
Mount Tom Station Layout

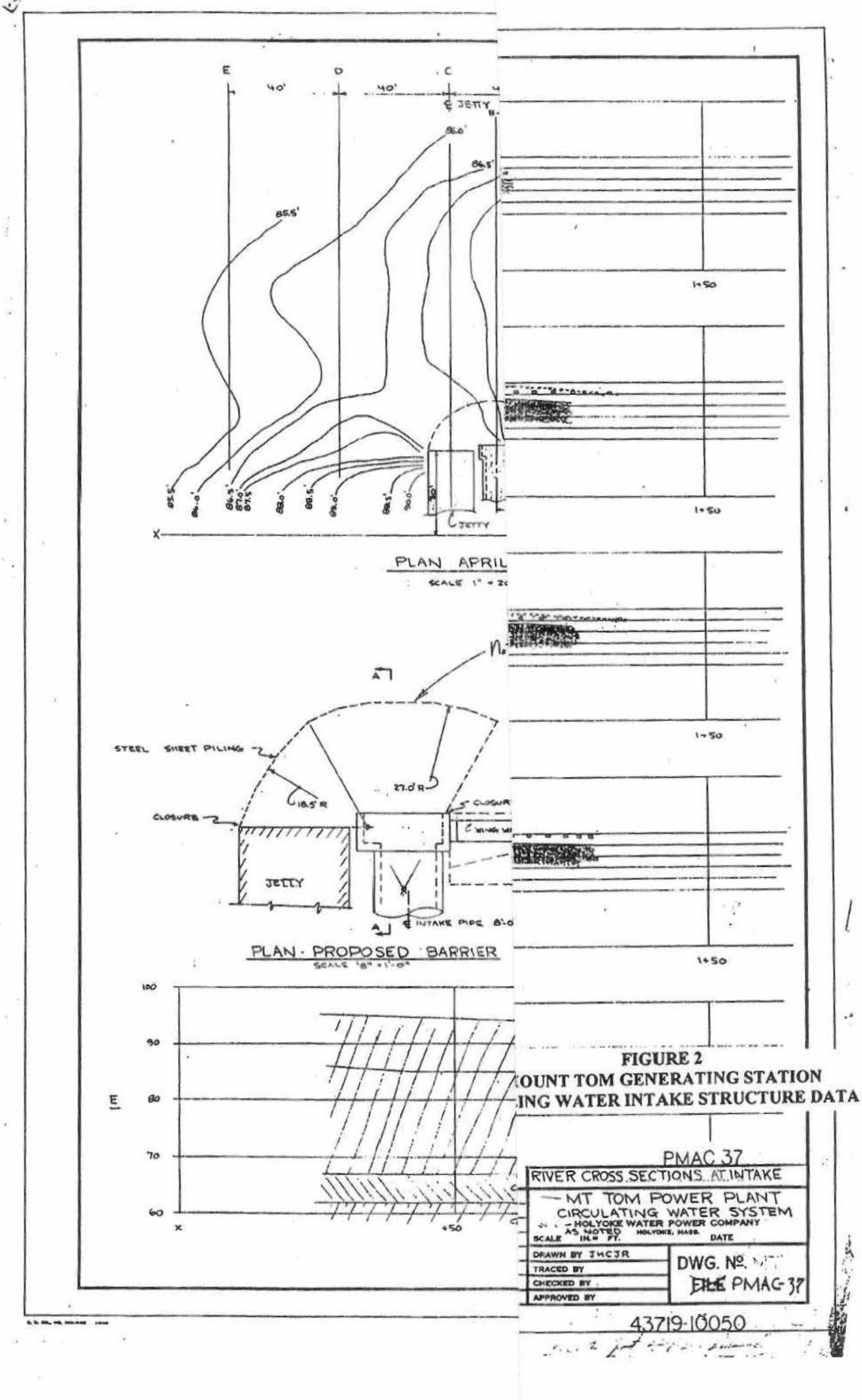


FIGURE 2
OUNT TOM GENERATING STATION
ING WATER INTAKE STRUCTURE DATA

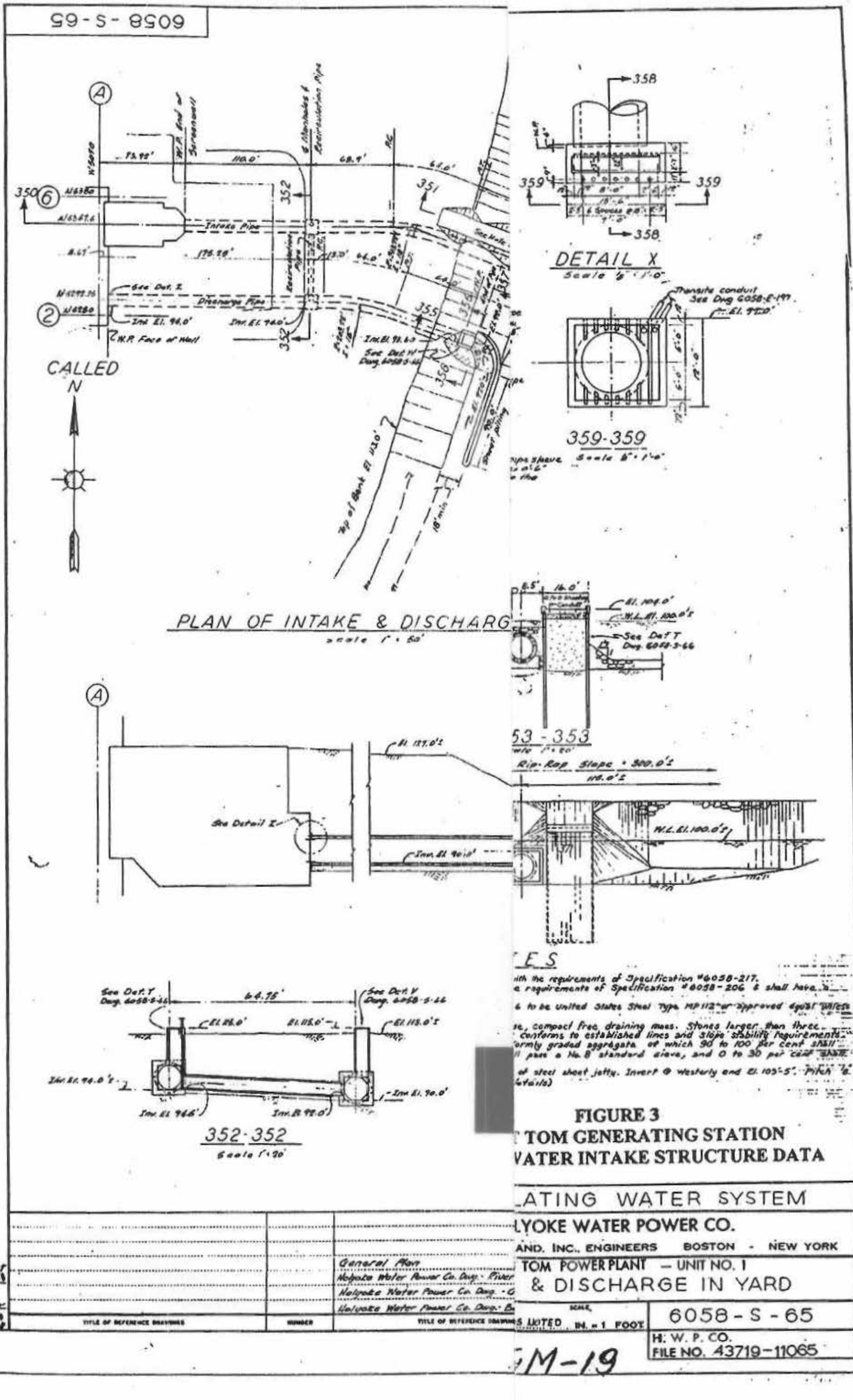


FIGURE 3
TOM GENERATING STATION
WATER INTAKE STRUCTURE DATA

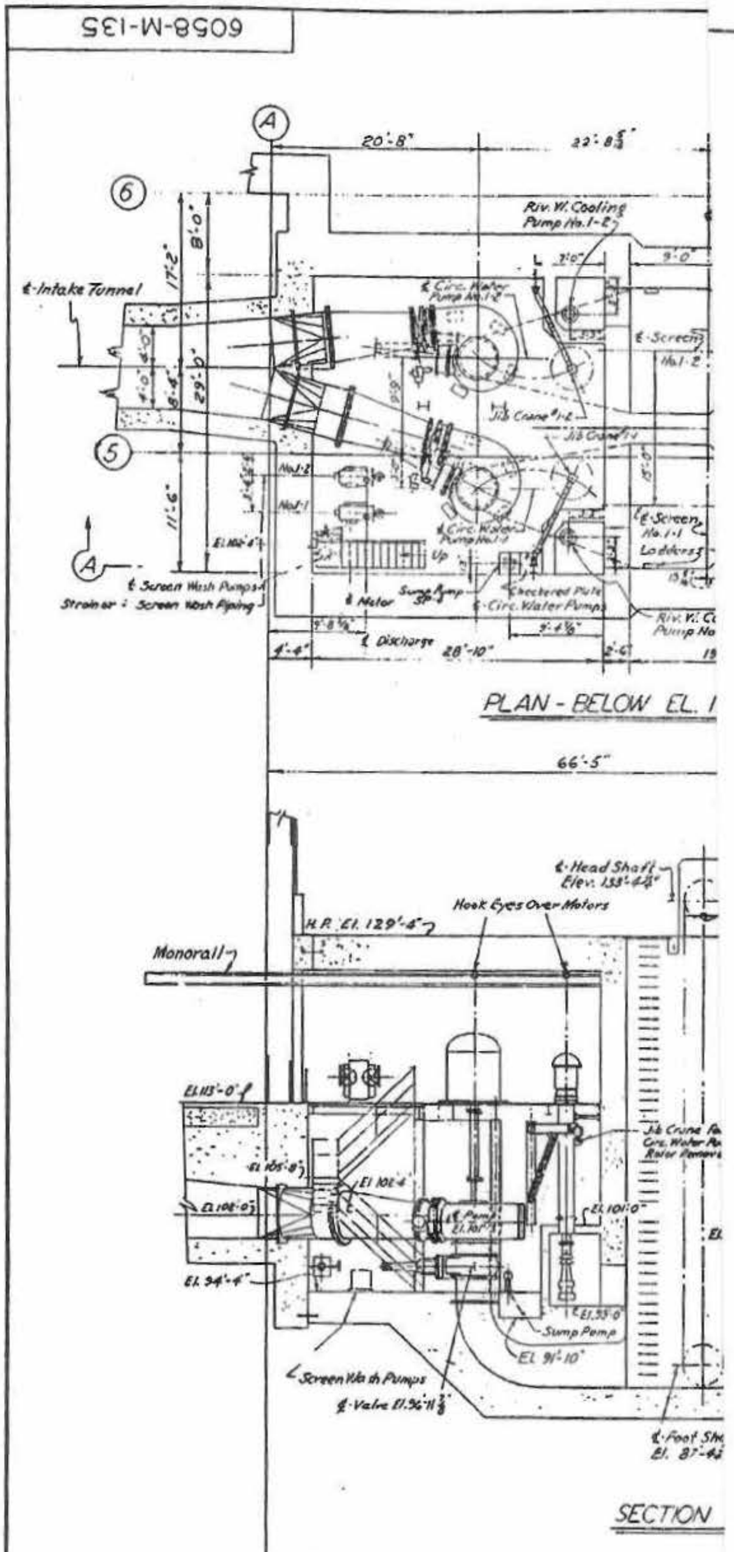


FIGURE 4
MOUNT TOM GENERATING STATION
COOLING WATER INTAKE STRUCTURE DATA

TITLE OF REFERENCE DRAWINGS	NUMBER	TITLE OF REFERENCE DRAWINGS
Circulating Water Piping - Sheet No. 1	6058-M-50	
Circulating Water Piping - Sheet No. 2	6058-M-51	
Station Cross Section	6058-M-130	
Screenwell Plans	6058-S-61	
Screenwell Sections	6058-S-62	
Screenwell Details	6058-S-63	

...UIPMENT LOCATION
...OLYOKE WATER POWER CO.
...LAND, INC., ENGINEERS BOSTON - NEW YORK
...IT TOM POWER PLANT — UNIT NO. 1
...L HOUSE - GENERAL ARRANGEMENT
SCALE 1/8" IN. = 1 FOOT
6058-M-135
H. W. P. CO. FILE NO. 43719-27135

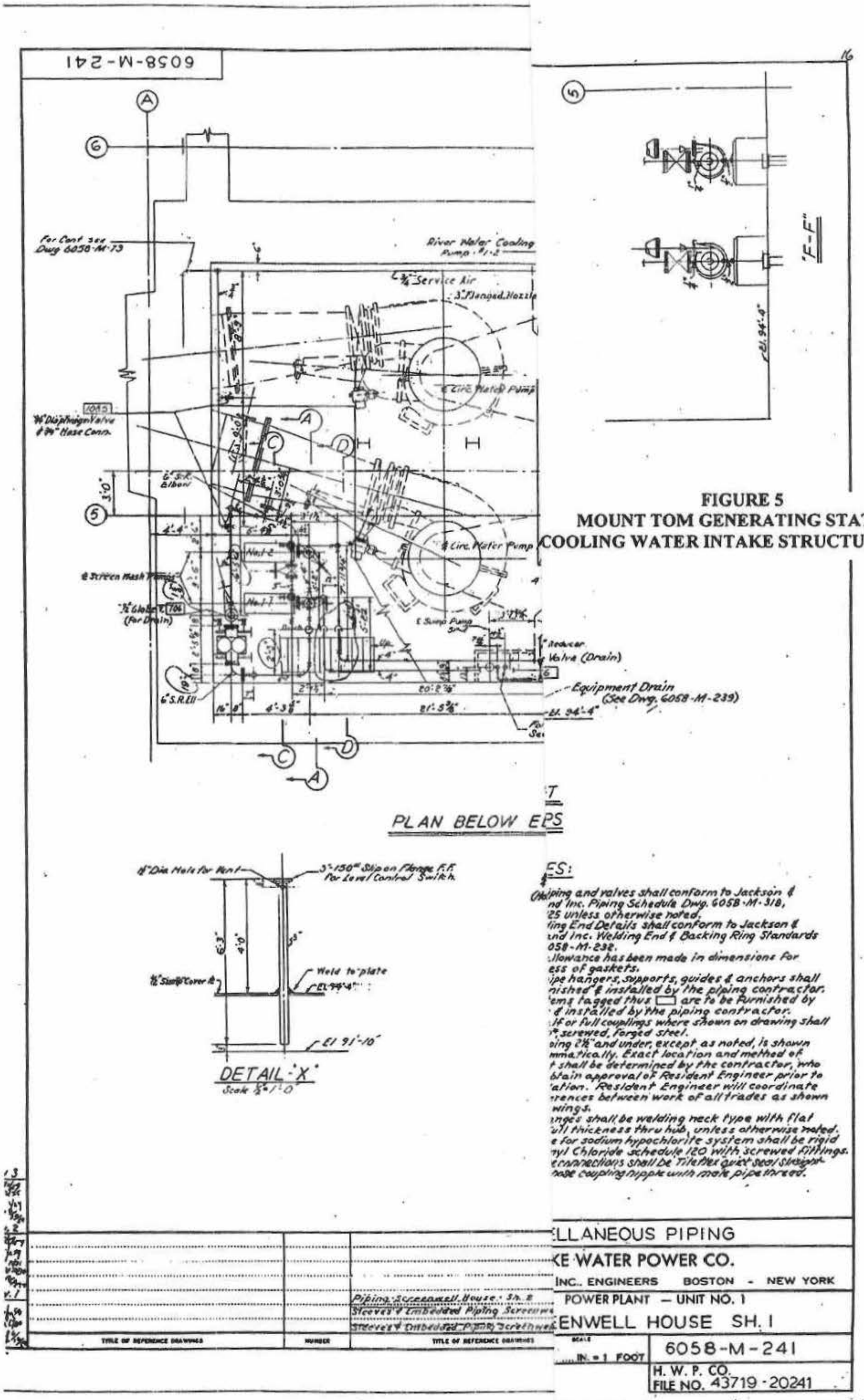


FIGURE 5
MOUNT TOM GENERATING STATION
COOLING WATER INTAKE STRUCTURE DATA

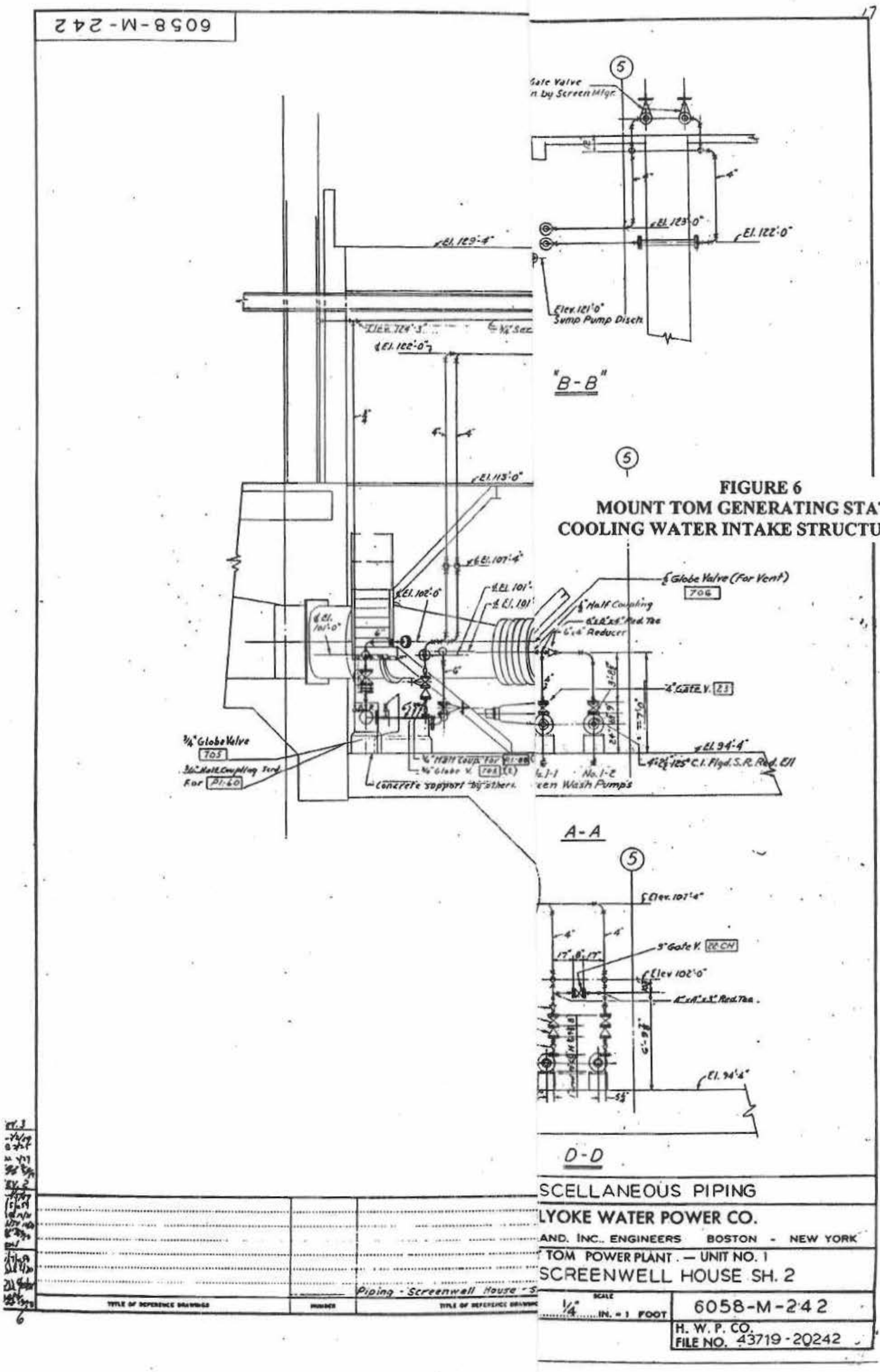
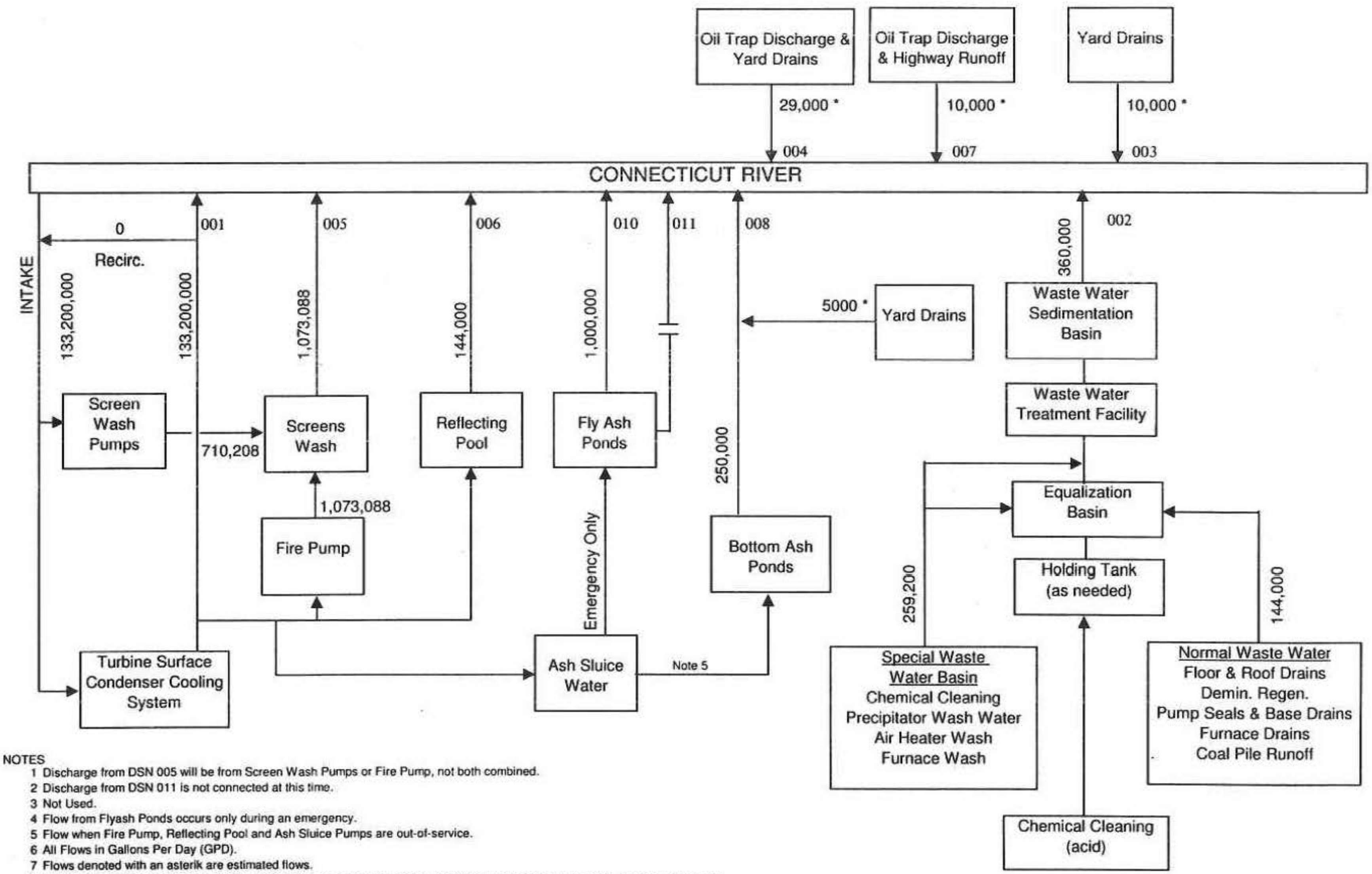


FIGURE 6
MOUNT TOM GENERATING STATION
COOLING WATER INTAKE STRUCTURE DATA

MOUNT TOM STATION WATER BALANCE

MA0005339

EPA I.D. 00846105



NOTES

1 Discharge from DSN 005 will be from Screen Wash Pumps or Fire Pump, not both combined.
2 Discharge from DSN 011 is not connected at this time.
3 Not Used.
4 Flow from Flyash Ponds occurs only during an emergency.
5 Flow when Fire Pump, Reflecting Pool and Ash Sluice Pumps are out-of-service.
6 All Flows in Gallons Per Day (GPD).
7 Flows denoted with an asterik are estimated flows.
8 This drawing reproduced from Mt. Tom Water Balance, dated Dec. 1991, NPDES Permit dated June, 1997. Recirc. Line added for clarity.

FIGURE 7

COOLING WATER INTAKE STRUCTURE DATA

HOLYOKE WATER POWER COMPANY

MOUNT TOM GENERATING STATION

PERMIT NO. MA0005339

DRAFT

COOLING WATER SYSTEM DATA REPORT
40 CFR 122.21(r)(5)

September 2005

Prepared by:

Kleinschmidt

Energy & Water Resource Consultants

HOLYOKE WATER POWER COMPANY

MOUNT TOM GENERATING STATION
PERMIT NO. MA0005339

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MOUNT TOM GENERATING STATION
Permit No. MA0005339

DRAFT

COOLING WATER SYSTEM DATA REPORT

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HOLYOKE WATER POWER COMPANY

MOUNT TOM GENERATING STATION
Permit No. MA0005339

DRAFT

COOLING WATER SYSTEM DATA REPORT

EXECUTIVE SUMMARY

The following Cooling Water System Data Report is being submitted to the Massachusetts Department of Environmental Protection (MA DEP) by Holyoke Water Power Company (HWPC) on behalf of the Mount Tom Generating Station (Mount Tom). The report complies with the U.S. Environmental Protection Agency (EPA) Clean Water Act 316(b) Phase II rule for required data to be submitted when Phase II facilities apply for a reissued NPDES permit 40 CFR 122.22(r)(1)(ii). Phase II existing facilities as defined in 40 CFR 125 subpart J must provide the following information, addressing the specific provisions of 40 CFR 122.21(r)(5), for each cooling water intake structure they use:

1. A narrative description of the operation of the cooling water intake system, its relationship to cooling water intake structures, the proportion of the design intake flow that is used in the system, the number of days of the year the cooling water system is in operation, and seasonal changes in the operation of the system, if applicable.

2. Design and engineering calculations prepared by a qualified professional and supporting data to support the narrative description.

The description contained within this document addresses the criteria required. Operating data is based upon the 2000 through 2004 Discharge Monitoring Reports that Mount Tom Station submits to MA DEP. All of the flow entering the CWIS is used for cooling purposes, including Circulating Water and auxiliary cooling water (River Water) pump flows, therefore a formal calculation is not needed to define the proportion of the design intake flow used for cooling purposes.

The average capacity factors based on 2000-2004 operating data for Mount Tom was 79.9 percent.

A review of the 316(b) rule applicability criteria indicates that Mount Tom qualifies as a Phase II facility: its cooling water intake design flow exceeds 50 MGD; its primary activity is to generate electricity; at least 25% of the water withdrawn is used exclusively for cooling water purposes; and the station was constructed prior to January 17, 2002.

1.0 COOLING WATER INTAKE DESCRIPTIONS

1.1 Cooling Water System Operation and its Relationship to the CWIS

Mount Tom Station is a single unit power plant that has one submerged-type Cooling Water Intake Structure utilizing a once-through, non-contact, condenser cooling water system during the generation process. The Circulating water system is the major user of water coming into the plant. This cooling water absorbs heat in the steam turbine steam surface condenser. The River Water system is the secondary cooling water system and is used to provide cooling water to several heat exchangers, including hydrogen coolers, lube oil coolers, the gland steam condenser and other plant auxiliary equipment. Circulating and River Water are discharged into the common underground 8-foot diameter, concrete discharge piping header that terminates in the Connecticut River at a point south of the CWIS along the shoreline.

The non-contact cooling water drawn from the Connecticut River enters the station through a single, open-ended, 8-foot diameter concrete pipe. The non-contact cooling water travels into the screenwell structure that contains the trash rack, traveling screens, Circulating Water pumps, River Water pumps and Screen Wash pumps.

The screenwell structure is essentially divided into two symmetrical sections, or bays, with each bay containing one vertical trash rack, vertical flow-through traveling screen, Circulating Water pump and River Water pump. Water enters the first compartment of the screenwell structure and splits into the two bays, separated by a concrete pier. After cooling water passes through the trash racks, it passes to the traveling screen compartment via an 8' x 8' square sluiceway (with sluice gate) to the front of the traveling screen. After passing through the screen, water is separately drawn into the suction side of the Circulating Water and River Water pumps. These two pumps each have their own separate suction inlets, which are designed integral with the intake structure.

Under normal operating conditions, the Mount Tom unit is operated near full capacity. During the period from May through October, mostly both Circulating Water pumps are operating at 45,000 gpm each and one of the two River Water pumps is operating for a combined design flow rate of 92,500 gpm. Pump design flows are shown in Table 1. During the November through April season, usually one Circulating water pump is used due to the cooler river water temperatures. The number of pumps operating are shown in Tables 2 and 3.

The Screen Wash pumps function to wash debris off the traveling screens when they get clogged with debris. The screens are automatically rotated and the spray wash pump activated when the pressure differential between the upstream and downstream side of the traveling screen (increases) reaches a predetermined point based on the amount of clogging.

The recirculation system is used during the winter season if ice is forming in the CWIS. The recirculation system is not used frequently. A portion of Circulating Water that has absorbed heat in the condensers is forwarded back to the front of the CWIS for deicing. This recirculation flow results in a small reduction in overall plant cooling water inlet flows. Since this flow is considered insignificant in proportion to overall total cooling water flow, recirculation flow is not deducted from the total design cooling water flow.

1.2 CWIS Periods of Operation and Flow Proportions

Mount Tom Station is designed and operated as a "base-load" plant, and operates with a high, net electric capacity factor. The capacity utilization rates for 2000 through 2004 are 84.8%, 85.3%, 75.7%, 83.5%, and 70.1%, respectively (Merchant 2005), based on a generation capacity of 147 MW. The five-year average net capacity utilization rate for Mount Tom is 79.9% (Table 7).

When the plant is operating, one or both Circulating Water pumps and one River Water pump are running. Periodically, the plant will operate the Circulating Water and/or River Water pumps when the plant is offline for condenser and Circulating Water system maintenance or other reasons.

The number of Circulating Water pumps operating is generally seasonal, depending on Connecticut River water temperature and/or plant operating capacity. In the summer months, both Circulating Water pumps are usually operating. The design intent is to have only one Circulating Water pump operating during the winter season when river water temperature drops below 50°F. Since 2000, operation of the Circulating Water pumps at Mount Tom has remained relatively consistent. Mostly, two-pump operation occurs from May to October (Table 2) and one-pump operation occurs during November to April (Table 3). Plant scheduled outages usually occur in the fall season (Table 6).

Other water uses that contribute to overall CWIS inlet flow are the two, 100% capacity, 250 gpm each, Screen Wash pumps. These pumps are connected in parallel and draw water from the Circulating Water pump discharge piping. One pump is operating while the other pump is in standby. Their flow volume is included in the design flow of the Circulating Water pumps, therefore the 250 gpm flow is not added to the total design flow of 92,500 gpm. The Screen Wash pumps are operated infrequently (Table 4) due to historical problems with operation of the pumps. Most of the time, the fire water system is used for backwashing the traveling screens (Table 5).

2.0 REFERENCES

Chain Belt Co. Dwg. No. H16522-1, Rev. 1, dated 3-27-58, General Arrangement of Two Four Post Type Traveling Water Screens 6T-24P-3/8 S.B.", for Mt. Tom.

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HWPC Dwg. No. 6058-M-163, Rev. 7, dated 6-20-61, "Flow Diagram Circulating Water"

HWPC Dwg. No. 6058-M-185, dated 5-27-58, Mt. Tom Power Plant Unit #1 Station Heat Balance 148,480 KW"

HWPC Dwg. No. 6058-M-241, Rev. 3, dated 7-17-61, "Piping Screen Well House SH. 1".

HWPC Dwg. No. 6058-M-242, Rev. 3, dated 7-17-61, "Piping Screen Well House SH. 2".

HWPC Dwg. No. 6058-S-65, Rev. 3, dated 6-19-59, "Intake & Discharge in Yard".

HWPC Dwg. No. PMAC-37, "River Cross Sections at Intake".

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